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The Magazine Devoted Exclusively to Abrasive Operations

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★ FEATURES

Developing Standard Time Data for Grinding Operations

Significance and Measurement of Surface Finish — Part 2

Transfer Grinder Permits Fully Automated Surface Grinding

A Newer and Tougher Electric Furnace Abrasive

New Honing Process Applied to Gear Finishing

OCTOBER 1956

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Chicago Wheels are available in all standard sizes and over 200 special shapes. This wide selection of these tough, fast cutting Chicago Mounted Wheels makes it possible for you to choose just exactly the right mounted wheel for your job. And delivery of most Chicago Mounted Wheels is prompt . . . right out of stock.

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OCTOBER, 1956—VOL. 2, NO. 6

Grinding and Finishing

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Hitchcock District Managers are listed on page 102.

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BPA

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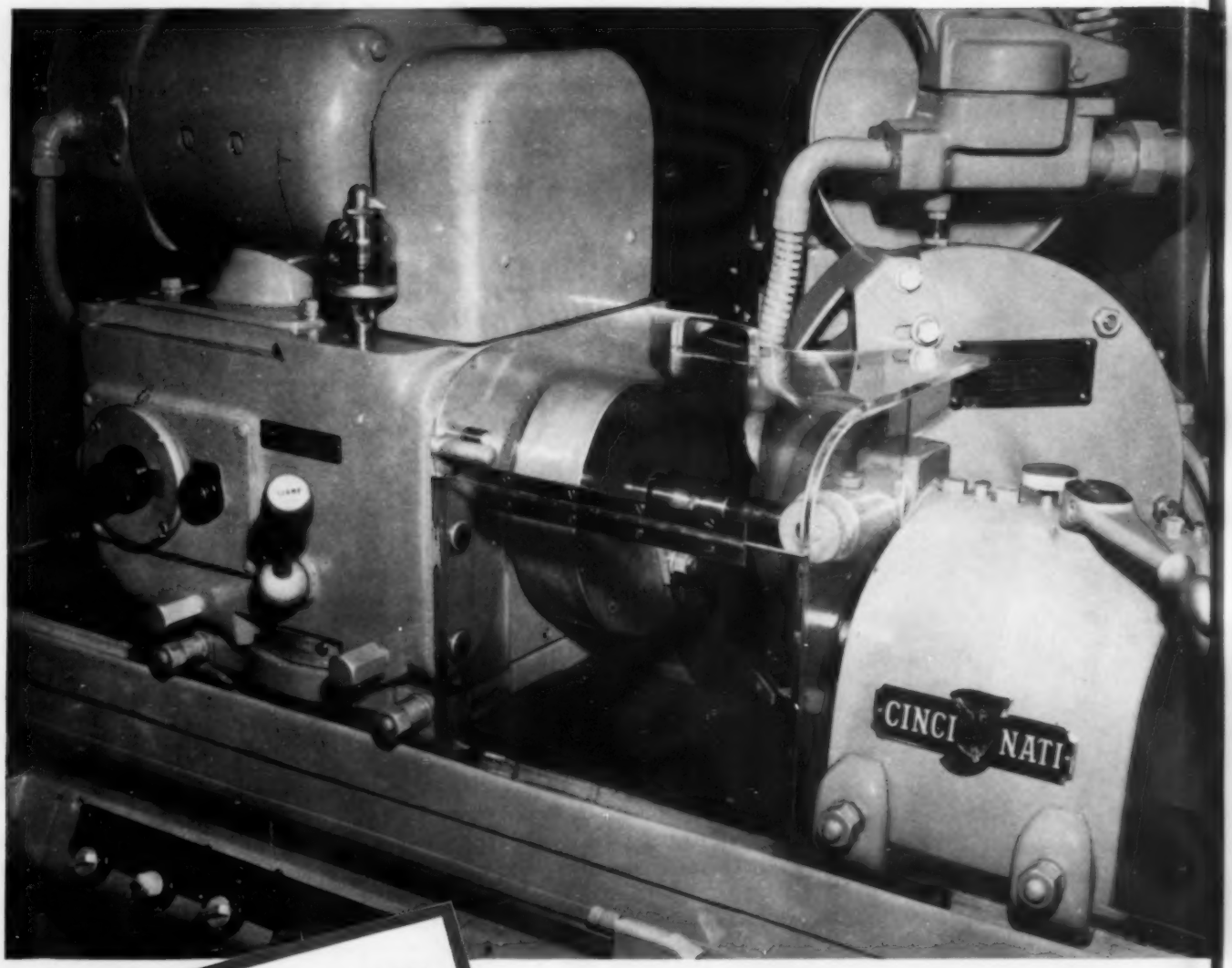
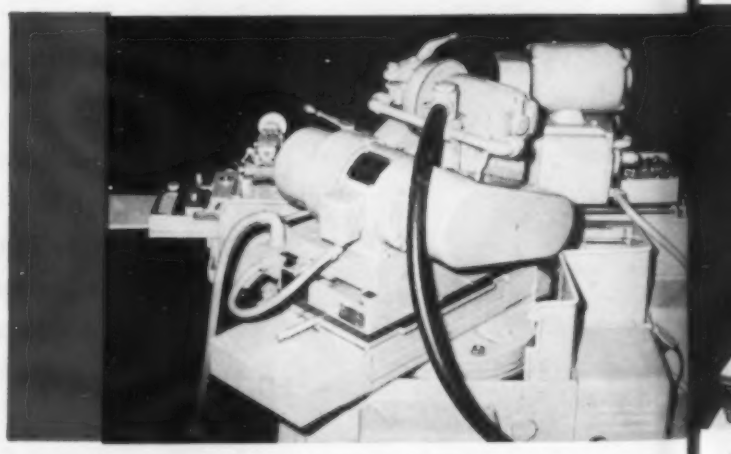


CINCINNATI FILMATIC 10" UNIVERSAL GRINDER

set up to grind simultaneously diameter and shoulder of titanium trip dogs. Wheel runs at 5000 fpm for these titanium parts.

FILMATIC



Double end motor and standard wheelhead swivel are shown to advantage in this view.

CINCIN

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

This Universal Grinder Gives You Both

Versatility and Production

Look at your universal grinders from this viewpoint: can they handle an occasional high production job at a reasonable cost? It's routine work for the CINCINNATI® FILMATIC 10" Universal illustrated here . . . grinding the diameter and shoulder on large quantities of small titanium parts. ¶ To obtain the highest quality finish on the two surfaces, the grinding wheel has been transferred to the right-hand end of the spindle, and the wheelhead swiveled about 45°. Built-in automatic infeed equipment aids the operator in maintaining a uniformly high rate of production. An angular truing fixture simplifies the truing and dressing chore. The 10" Universal's extra measure of power is a big factor in production, too. Consider these items compared to other machines in its class:

- Largest grinding wheel; 12" dia. x 1½" face
- Most powerful wheelhead motor; 2 hp
- 50% larger headstock motor
- Exclusive FILMATIC grinding wheel spindle bearings

In addition to all these production advantages working for you on the occasional high production job, the CINCINNATI FILMATIC is a true universal. Wheelhead swivels 180° and 220°, upper and lower, respectively; headstock swivels 180°; headstock speeds are infinitely variable 60 to 600 rpm. Sounds good for your shop, doesn't it? Sweet's Machine Tool File contains brief specs.; for complete data, write for our catalog G-577-5.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Angular wheel truing attachment for truing and dressing two grinding surfaces on wheel.

CINCINNATI FILMATIC 10" Universal Grinding Machine. Complete information in catalog No. G-577-5.

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GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

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K-7

NEVER LOADS THE WHEELS

K-7 solutions do not load work wheels, and this important advantage means (1) fewer dressings, (2) longer wheel life and (3) a true ground finish (rather than a burnished or smeared finish). In addition, with K-7 (because it does not load) you can often use a harder (1-2 grades) and finer (10-20 points) grit wheel, resulting in better work at lower cost.

Investigate K-7 for use in grinding all steels, cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. (Not recommended for non-ferrous metals.) It is an all-chemical water soluble liquid concentrate, transparent and colorless in solution. It is non-foaming and runs absolutely flat under all conditions. Low pH (alkalinity) makes it easy on the skin. Send for details.

CONCENTRATION TEST KIT

With this pocket size Concentration Test Kit K-7 users can check the concentration of the solution right at the machine. Only takes a minute or two.

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F. E. ANDERSON OIL COMPANY INC.
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Letters to the Editor

Standard Data

Will you please send me a copy of "How Grinding Standards Are Established With Standard Data"—by E. Cyrol, I believe.

I missed the magazine articles, but noted a reference to them on page 6 of the August issue of GRINDING and FINISHING.

Since we are at present in the process of setting up such a system, any pertinent information will be greatly appreciated.

If no reprints are readily available, I would appreciate knowing what issues of GRINDING and FINISHING the articles appeared. Thank you.

B. Ragsdale
Manufacturing Engineer
General Electric Co.
Evendale, Ohio

A request has been received in this department to obtain for our Time Study and Methods Department the following:

Five copies of "How Grinding Standards Are Established with Standard Data".

J. D. McMakin
Director of Purchasing
Austin-Western Works
Baldwin-Lima-Hamilton Corp.
Aurora, Ill.

We're sorry that Mr. Cyrol's first series on standard data for grinding operations which appeared in GRINDING and FINISHING, May through August, 1955, is not available just now. We feel you'll be interested in the series by Mr. Cyrol beginning in this issue, which represents the results of additional studies in this important field. The editors anticipate that the present series, and possibly last year's articles, will be available in reprint form when the series is complete.

Finish Measuring Techniques

Please send Tear sheet, entitled, "Finish Measuring Techniques", from August, 1956, issue of GRINDING and FINISHING.

Steve Spargo
Maintenance Control Engineer
Reynolds Metals Co.
Richmond, Va.

Would you please send ten reprints

on article "Finish Measuring Techniques", by E. W. Bolles, Micrometrical Mfg. Co., Ann Arbor, Michigan, found on page 30 in GRINDING and FINISHING.

John Silvia
Facilities Engineer
General Electric Co.
Taunton, Mass.

Will you please send us twelve reprints of the article entitled "Finish Measuring Techniques" . . .

H. J. Miller
General Manager
Speed-D-Burr Corp.
Glendale, Calif.

After supplying these requests our supply of tear sheets of the Finish Measuring Techniques article by E. W. Bolles has been exhausted. The article may be available later in reprint form; watch for an announcement in this regard.

Why Ruin Abrasive Belts

In the July edition of GRINDING and FINISHING you carried an article entitled "Why Ruin Abrasive Belts?" . . . We have a request from our French affiliate, Behr-Manning de France, asking for permission to translate this story in French for eventual publication in local trade journals.

We request that this permission be granted by your editors so that our affiliate plant may pass on this valuable belt application information to French industry.

C. S. Duxbury, Jr.
Norton Behr-Manning Overseas Inc.
Worcester, Mass.

Article Index

We are regular subscribers to the publication GRINDING and FINISHING and have bound the 1955 issues into a permanent volume. For this reason, we need an index for locating articles that have appeared in the past, and should appreciate your sending us a copy of the index for 1955.

Marshall W. Allen
Brown & Sharpe Mfg. Co.
Providence, R. I.

The editors anticipate that an editorial index for GRINDING and FINISHING ARTICLES appearing in 1955 and 1956 will be available soon after the end of the year.

Abrasive Cut-Off Wheels

Will you please send me a copy of the article "Are You Getting Your Money's Worth From Your Abrasive Wheels?" which appeared in the March 1956 issue of GRINDING & FINISHING.

Bernard Schaffer
President
Schaffer Air Industries, Inc.

Tear Sheets Sent.

How to eliminate GRINDING WHEEL

For routine or standard grinding jobs—
• order Dayton Safety Grinding Wheels and *relax!*

For those "hard-to-do" jobs—
• toss the problem in the lap of our engineers and *relax!*

Get the details of our service today or the name of your nearest distributor.

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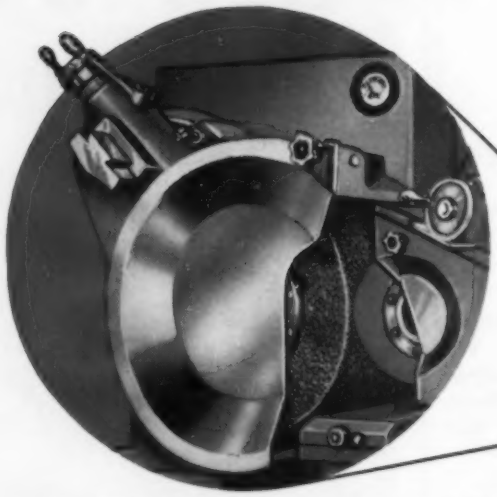
VAN NORMAN

New



The new Van Norman No. 2C Grinder is *engineered* for fast, accurate, economical grinding of parts. Incorporated in the many outstanding features is the *15 HP* main drive motor which provides ample power for every grinding job. Couple this with the totally enclosed rugged grinding wheel spindle and you get close-tolerance smooth finishes plus chatterless, trouble-free operation.

Compare These Outstanding Features

- Hard chrome plating of regulating wheel slide after hand scraping, preserves original factory built-in accuracy.
- Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life, assuring chatterless trouble-free operation.
- Spindles require no warm-up period, eliminating "creep" which has always been a problem in grinding operations.
- Infinitely variable regulating wheel drive.
- Totally enclosed fan cooled, dynamically balanced 15 HP main drive.
- Independent hydraulic wheel truing devices for each wheel.
- Fine hand wheel adjustment on diameter of work piece.

Phone, wire or write for full details on the new Van Norman No. 2C Centerless Grinder.

Grind Parts Like These Accurately, More Economically

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 2C Centerless Grinder

...Features 15 HP Main Drive

Assuring Precision, Close-Tolerance Grinding

VAN NORMAN NO. 2C
Capacity: 0" to 4¾"
Grinding wheels available: 24" x 4" x 12"; 24 x 6" x 12"; 24" x 8" 12"
Regulating wheels available: 12" x 4" x 5"; 12" x 6" x 5"; 12" x 8" x 5"
Automatic cycling and gauging available.

Don't wait . . . for extra profits install a Van Norman Machine now!
They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . See your dealer or write Van Norman Company. Conditional Sales Contracts not available to Export.

COMPANY **SPRINGFIELD 7, MASSACHUSETTS**

VM 6-20

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You're gonna be nuts about...

ABRASIVE
ACCURACY BOOSTS PRODUCTION

7" 1 HP — $1950.00

12" 2 HP — $1985.00

.....the entirely NEW

ABRASIVE *six eighteen*

hand feed precision surface grinder!

Everyone else in your company will, too! The new Abrasive Six Eighteen combines new size (6" x 18") and modern design with new Abrasive-engineered operational features.

Our new illustrated catalog tells all . . . all about Abrasive's effortless anti-friction roller ways; totally enclosed motorized spindle; new, chatterless cable table drive (successfully tested for over 1,000,000 quick reversals); convenient, waist high table and elevating hand wheels; deep, heavily-ribbed saddle; optional 12" or 7" wheel head; and how you can have the elevating and table hand wheels on either right or left.

Yours Free!

ABRASIVE

Machine Tool Company

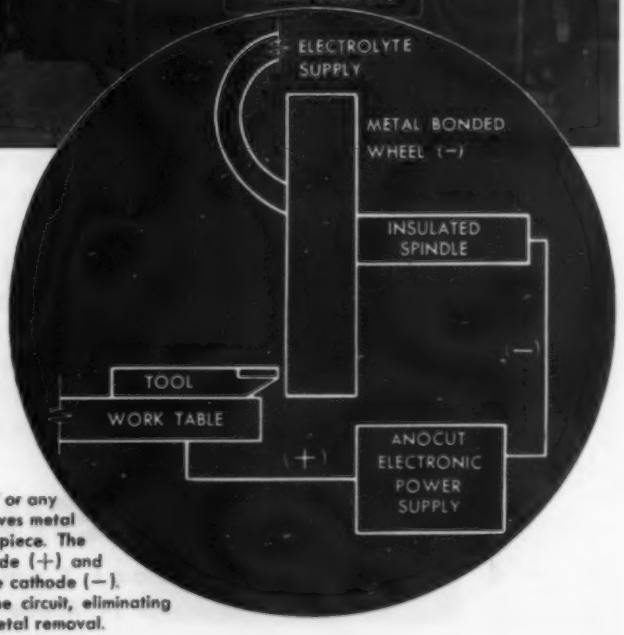
East Providence 14, Rhode Island

Circle No. 205 on postpaid card

Cut Carbides

Anocut Automatic Electronic Control and Electrolytic equipment can be installed on any good quality standard grinder. Shown here is a production installation of the new Hammond oscillating head off-hand carbide tool grinder (Model OCE-6) especially designed and equipped for immediate connection to the Anocut automatic electronically controlled electrolytic power unit.

(Photo courtesy of Kennametal, Inc.)



Not to be confused with the "spark-arc" or any other method, the Anocut process removes metal by electrolytic deplating of the workpiece. The tool or part to be shaped is the anode (+) and the metal-bonded grinding wheel is the cathode (−). The electrolyte (coolant) completes the circuit, eliminating over 90% of the abrasive action in metal removal.

like Butter?

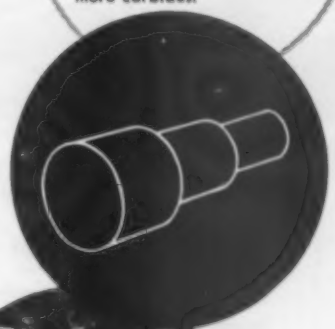
WE CAN'T!

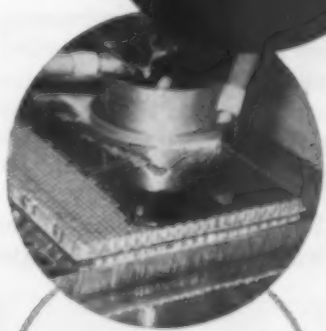
We make no claims that with our Anocut automatic electronic control and electrolytic equipment you can knock your tool grinding costs down to zero. The best tools are often tough to grind, but we can often increase grinding speed and because we grind with an action that's only 10% abrasive and 90% electrolytic we have helped many people, including carbide manufacturers as well, set some downright amazing records for savings in wheel costs.

This is important because tool grinding costs tend to go up as modern automatic high-speed machine tools pull direct labor costs down. In fact, tool grinding costs sometimes equal or exceed direct labor production costs. Sometimes tool grinding is a neglected area in cost reduction even in plants where the most modern production machinery is used. It may pay you handsomely to look into this new way of grinding hard tool materials—faster, with less likelihood of tool damage and with a ten to one reduction in abrasive cost.

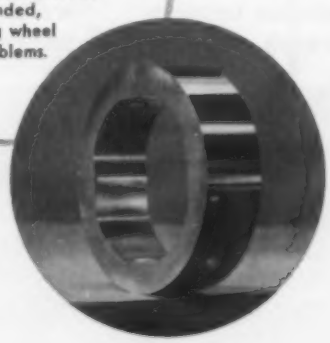
If you're grinding carbide tools or have other difficult grinding problems, why not write or phone us for literature? If our equipment and process will answer your problems, fine. If not, we'll be the first to let you know.

Anocut makes it practical to apply the advantages of cemented carbides—hardness, strength, wear resistance—to a much broader range of *production* parts. Now, for better products and lower costs, you can use more carbides.





Production of this hardened steel cam ring increased 300% when the Anocut system replaced conventional grinding. Wheel life was greatly extended, thus reducing wheel dressing problems.



Fragile honeycomb materials are ground and shaped by the Anocut method without burr or layover. Temperature-sensitive metals too, are easily handled because the Anocut system is a "cold" process.

ANOCUT Engineering Company

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The Electronic "plus" in Grinding

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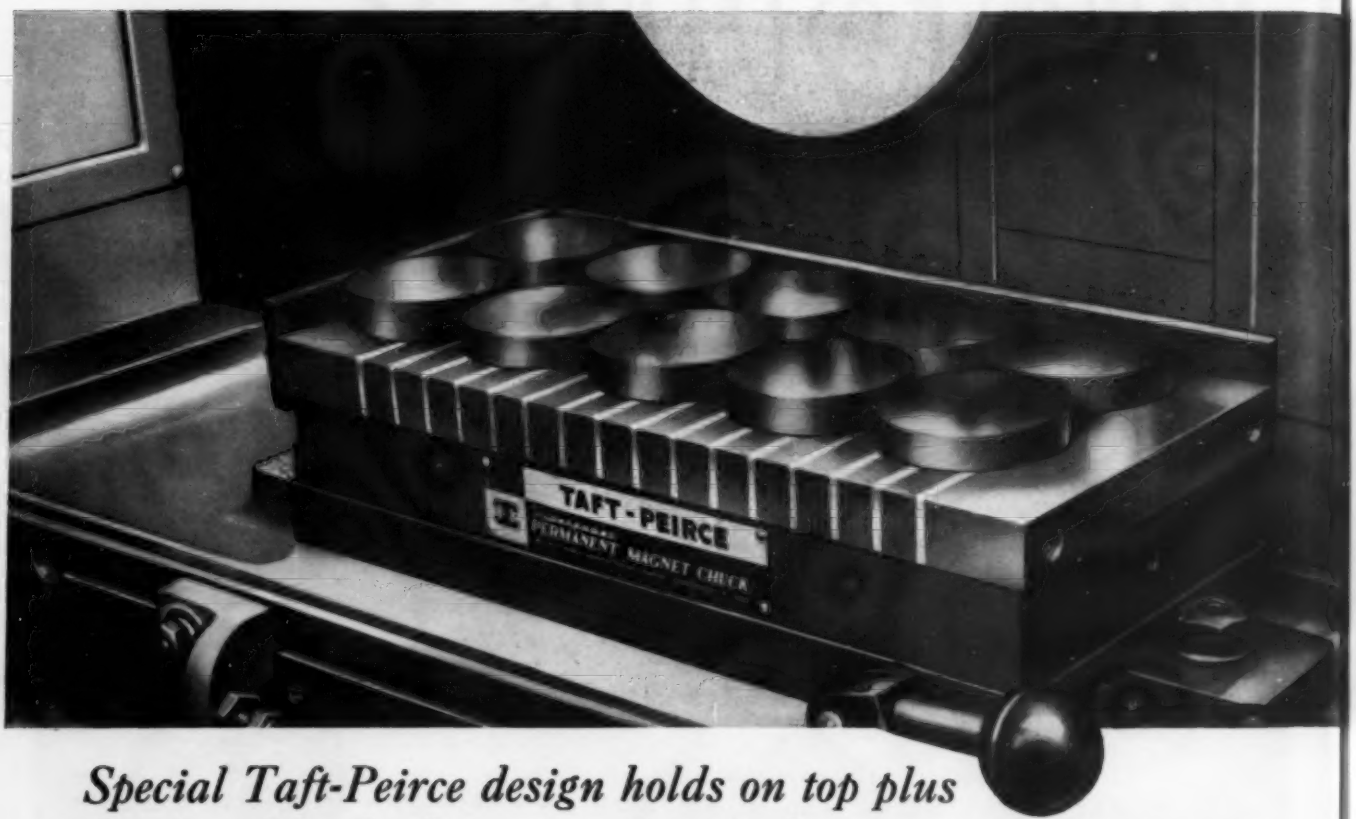
The Only Permanent Magnet Chuck



Special Taft-Peirce design holds on top plus front and back edges, permits grinding more pieces per pass

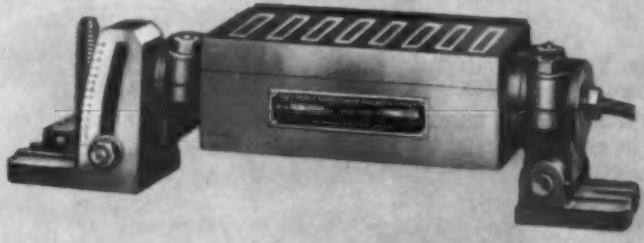
Never before have permanent magnet chucks been able to handle so many jobs! This new versatility comes from a combination of four very important design features found only in Taft-Peirce Superpower Permanent Magnet Chucks.

- Low height — increased clearance between wheel and chuck gives higher work capacity.
- Releases quickly in "Off" position — minimum of residual magnetism.
- More magnetic poles for its size — uniform pole spacing allows firm holding of smaller parts.
- Poles extend full width of face plate, no waste space or dead spots — increases capacity and simplifies setups.

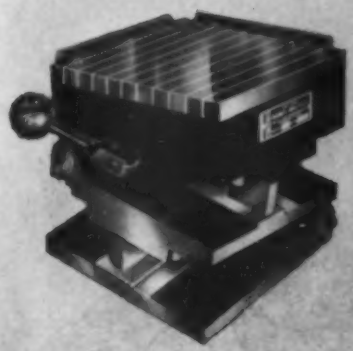
Taft-Peirce offers a wide selection of electromagnetic rectangular chucks. Key features: Extra heavy concentration of magnetic flux, greater magnetic work area, all-steel, one piece construction, sealed electrical components. Result: Maximum use of energy, more even distribution of magnetic flux. There are seventy-five standard sizes, plus a very extensive line of special patterns.

Plain Face Plate Chuck (left) is a general-purpose type, used for most chucking applications. Fine Mesh Chuck (center) has closer pole spacing, holds work of very small or thin section. Longitudinal Poles Chuck (right) holds long, narrow work firmly along entire length of piece.

with 100% All-Over Holding Power



ADJUSTABLE CHUCKS



Taft-Peirce modern chuck features are also available in several standard adjustable models designed to save setup time and insure accuracy on angular grinding jobs.

Duplex Model Electromagnetic Chuck (top illustration) is a precision grinding fixture, swivels to 90° on either side of horizontal, tilts to 14°. Clamps rigidly at any setting.

Sine Angle Permanent Magnet Chucks are available in either simple or compound (lower illustration) models. Angles from 0° to 90° are set quickly and surely with standard gage blocks. Electromagnetic models can also be furnished from stock.

Permanent Magnet Chucks are furnished in sizes from 3″ x 6″ to 10″ x 15″. Check into the amazing holding power and see how it can simplify your grinding, planing, and light milling operations. Electromagnetic Chucks range in sizes from 4″ x 8″ to 36″ x 60″. Larger chucks can be assembled from these standard Superpower units.

All types and sizes of standard Taft-Peirce Magnetic Chucks are readily available. Special chucks for unusual holding applications are designed and built on request. Write for catalog on complete line of Superpower Electromagnetic and Permanent Magnet Chucks — then make sure you . . .

Tips

ON USING MAGNETIC CHUCKS

Always position work on chuck to introduce maximum magnetic flux. Flux is dependent upon the total gap length in contact with work. Setup in Fig. 1-A will hold piece firmer than setup in Fig. 1-B

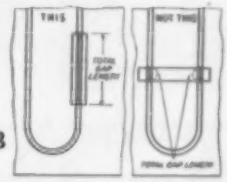
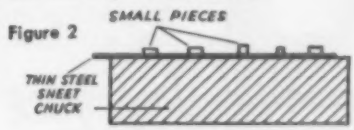


Figure 1-A Figure 1-B

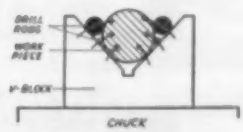
With exceptionally small pieces, place a thin steel sheet upon chuck and the small pieces on top of it, over the gaps, as in Figure 2. Steel sheet will concentrate flux through the pieces.

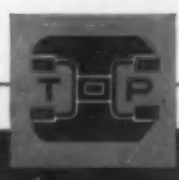
Figure 2



When holding round work in magnetic V-blocks on a chuck, more flux and holding power can be obtained by using appropriate sizes of drill rod to provide additional points of contact, as shown in Figure 3.

Figure 3





TAKE IT TO TAFT-PEIRCE

The Taft-Peirce Manufacturing Company
Woonsocket, Rhode Island

T-P Means TOP Precision

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HERE'S HOW YOUR SIMONDS ABRASIVE CO. DISTRIBUTOR SPELLS OUT SERVICE

S peedy supply

No waiting for distant shipments. Your Simonds distributor is located practically on your own "doorstep"—giving you the advantages of fast delivery, first-hand knowledge of your operation, and real help in emergencies.

E xpert guidance

A satisfied customer is more important than a single sale to your distributor. That is why he makes a point of suggesting the grinding wheel ordering quantities that give the best possible price break.

R equisitions reduced

Your local Simonds distributor is a "single source" for all your grinding needs, eliminating the necessity of requisitioning from a number of different sources.

V ariety of stock

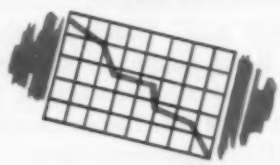
Everything you need — grinding wheels, mounted wheels, abrasive segments, polishing grain—can be supplied accurately and promptly from your Simonds distributor's complete and varied stocks.

I nstant price quotations

Your Simonds distributor is equipped to quote net prices on *any* quantity of grinding wheels instantly. No waiting for complex calculations.

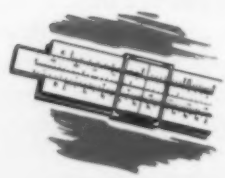
C osts reduced on inventory handling

Your distributor's stockroom is your storeroom saving you much of the clerical expense of inventory work and freeing valuable space for production purposes.



E ngineering assistance

On tough problems calling for technical aid, your distributor can bring you the benefits of Simonds field engineers. This is an extra free service — and one that might reveal new economies for you.



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PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

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diamond tools for general purpose use IN LOW COST G-P KIT!

MEETS ALL SHOP REQUIREMENTS

ORDER TODAY

In Genuine Calf Leather Kit

- 1 Abrasive "Red Band" diamond tool with 20 fine, whole natural stones weighing approx. 2.5 carats; for straight dressing wheels up to 20 x 1½
- 1 Abrasive "Red Band" tool set with one approx. .30 carat diamond for straight, form and radius dressing.
- 1 Abrasive "Red Band" tool set with one approx. .50 carat diamond for general purpose dressing
- 3 Phonopoint "Red Band" tools with fine whole natural diamonds in 60°, 90° and 120° angles for form and radius dressing.
- 1 Abrasive Diamond Scriber
- 2 Abrasive Tool Holders
- 1 Sturdy key

If bought separately tools together with kit would cost $75. Each tool is backed by the Abrasive guarantee of "Red Band" quality. Complete instructions come with each kit which is numbered for your protection.

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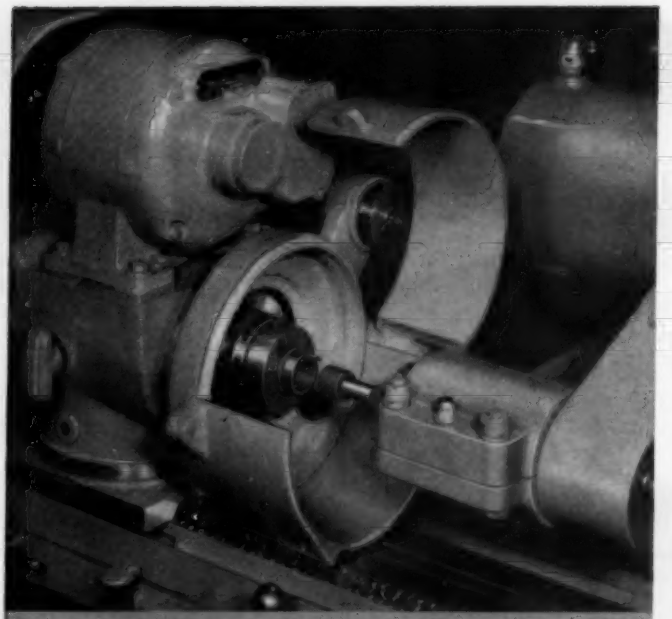
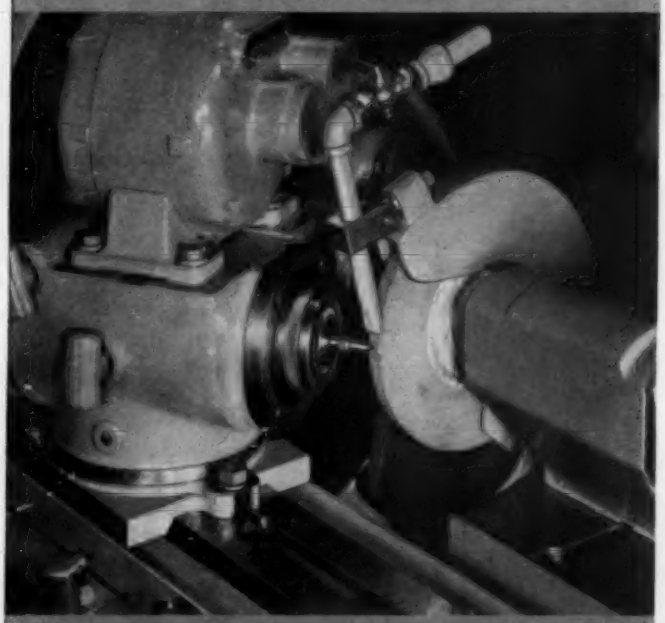


Grinding a straight hole with the work held in a step chuck.



Grinding sharp taper on metering needle held in collet with workhead swiveled 30°.

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Combines inherent accuracy with broad flexibility for faster handling of your diversified jobs. Mounts interchangeable wheelheads for internal and external spindles. Hole and external capacities are 3″ diameters, maximum depth 4″. Collets and step chucks mount directly in lathe-type spindle.

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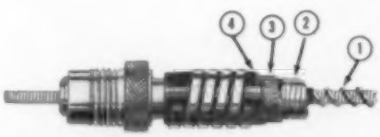
According to the Shop Foreman, the latest hand tool that has all these advantages is the Dumore Super-Flex shaft tool. "We like it because it takes all our ¼" and ⅛" shank tools and performs extremely well on our close tolerance tool and die work. Even after day-long use, worker fatigue is practically non-existent. It has cool operation and is vibrationless. The 22,000 rpm output gives us ample speed for clean, fast, precision metal removal. It is the handiest, most efficient hand tool we have."



BUILT-IN EFFICIENCY

Bronze liner encircles the shaft (1) which acts as a bearing and confines rotation within a definite radius. It prevents vibration, whipping and acts as lubricant to the shaft. The armored wire casing (2) is surrounded by wire braid (3) for further insulation and covered with neoprene (4) which is oil, grease and water resistant. For further information on the Super-Flex and other precision hand tools, write to the Dumore Company, 1326 Seventeenth St., Racine, Wis.

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DUMORE TOOL POST GRINDERS

MOUNTED ON USED MILLER BASES, the Series 5 Dumore Tool Post Grinders provide manufacturer, Scully-Jones, Chicago, with dependable high production precision grinding equipment at amazingly low cost.

As the plant manager says, "Over many years' use we have learned to expect very close tolerances, low scrap and trouble-free operation from our Dumore Grinders. The extremely low depreciation, maintenance and set-up costs make this unit one of the most satisfactory tools in the plant. As long as Dumore Grinders and serviceable used machine tools are available we need never lack for precision grinding equipment."

Series 5, Dumore Tool Post Grinder, ½ hp distributed field, continuous-duty rated universal motor. Speeds from 4600 to 42,500 rpm for wheels from ⅛" to 5". Performs a wide variety of internal and external grinding jobs at high production rates. Accuracies to .0001" and surface finishes of 6 to 8 micro-inches. For lathes with 13" to 18" swing . . . and . . .

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DUMORE

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AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

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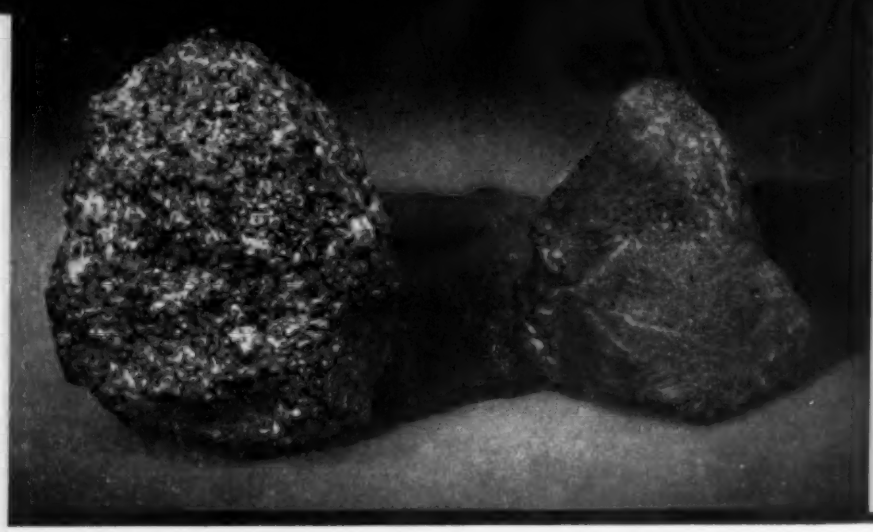


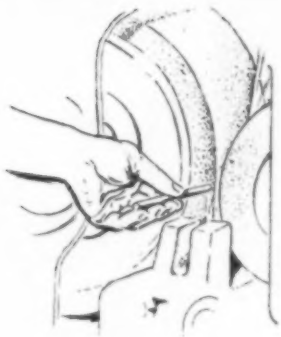
Different In Every Way! New 44 ALUNDUM abrasive (at right) *looks different* from ordinary aluminum oxide abrasive, with a finer grained surface that denotes greater density and toughness. That's because it's *made differently*, by a special Norton-developed electric furnace process. And that's why it *performs differently*, with new time-and-money-saving "Touch of Gold" advantages.

INTRODUCING . . . the NEW

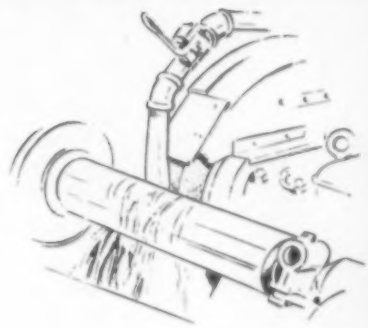
44 ALUNDUM* abrasive

. . . most sensational non-premium abrasive ever developed . . . with new "TOUCH of GOLD" benefits for better, lower cost grinding

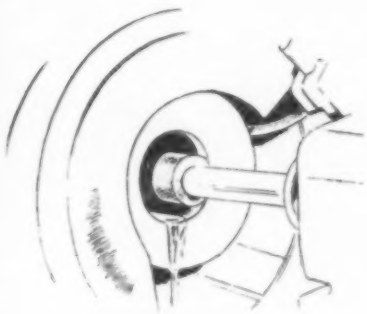
44 ALUNDUM abrasive gives excellent results on many grinding applications



CENTERLESS

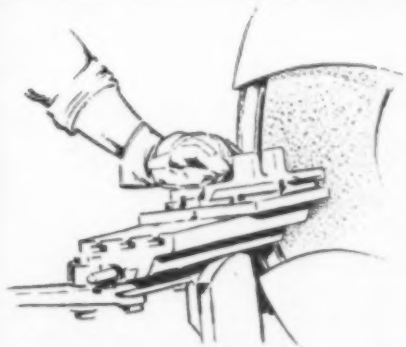


CYLINDRICAL



INTERNAL

SNAGGING



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MOUNTED WHEELS

. . . also a standout for saw gumming, ball grinding and thread grinding.

The big news about the new 44 ALUNDUM abrasive is this:

For a non-premium priced aluminum oxide abrasive, its performance, job range and service life are truly sensational.

It's a real work-horse abrasive — with extra ruggedness and durability that can take on a lot of tough grinding jobs and come back for plenty more.

This has been proved in more than 1100 tests. Plants all over the country have reported that 44 ALUNDUM wheels have these advantages over ordinary aluminum oxide wheels:

LONGER LIFE	FASTER RATE OF CUT
COOLER CUTTING	MORE PIECES PER DRESSING
HOLD FORM BETTER	BETTER FINISH

Typical Reports

Centerless Grinding. "44 ALUNDUM wheels much more versatile; also, time cut on one 14-hour job to 10 hours."

Cylindrical Grinding. "More pieces per dressing and longer wheel life."

Internal Grinding. "Freer cutting, hold form better with less dressing and improved finish."

Snagging. "Faster cutting, better finish, much less depth of burn."

Disc Grinding. "Coil spring production increased from 100,000 to 125,000."

Ball Grinding. "Roughing production increased 46% per wheel, with excellent performance duplication from wheel to wheel."

Thread Grinding. "Hold form better, 50% less dressing, maintain better tolerance with no sign of burn."

Mounted Wheels. "Four times longer lasting, with equal rate of cut."

Straight Facts

New 44 ALUNDUM abrasive is not a cure-all. For example, nothing can replace 32 ALUNDUM abrasive for precision grinding on high speed steels or CRYSTOLON* abrasive for most non-ferrous grinding jobs.

But — on any job where non-premium priced aluminum oxide abrasive is used, "44" will give results ranging from at least equal to very much better. And — "44" has a much wider job range.

Take advantage of this outstanding new abrasive value. See your Norton Distributor for 44 ALUNDUM wheels in the bonds, wheel types and sizes you need. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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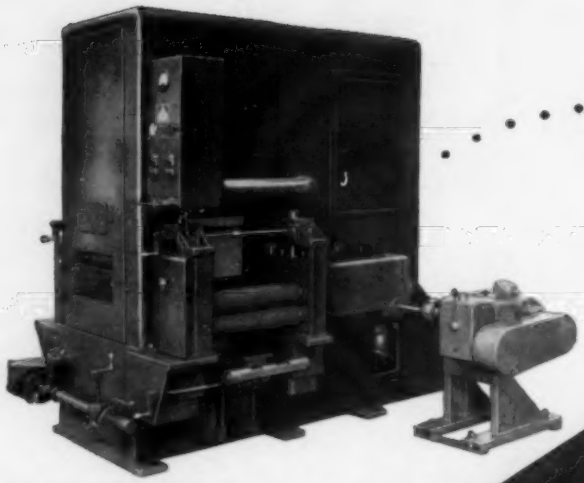
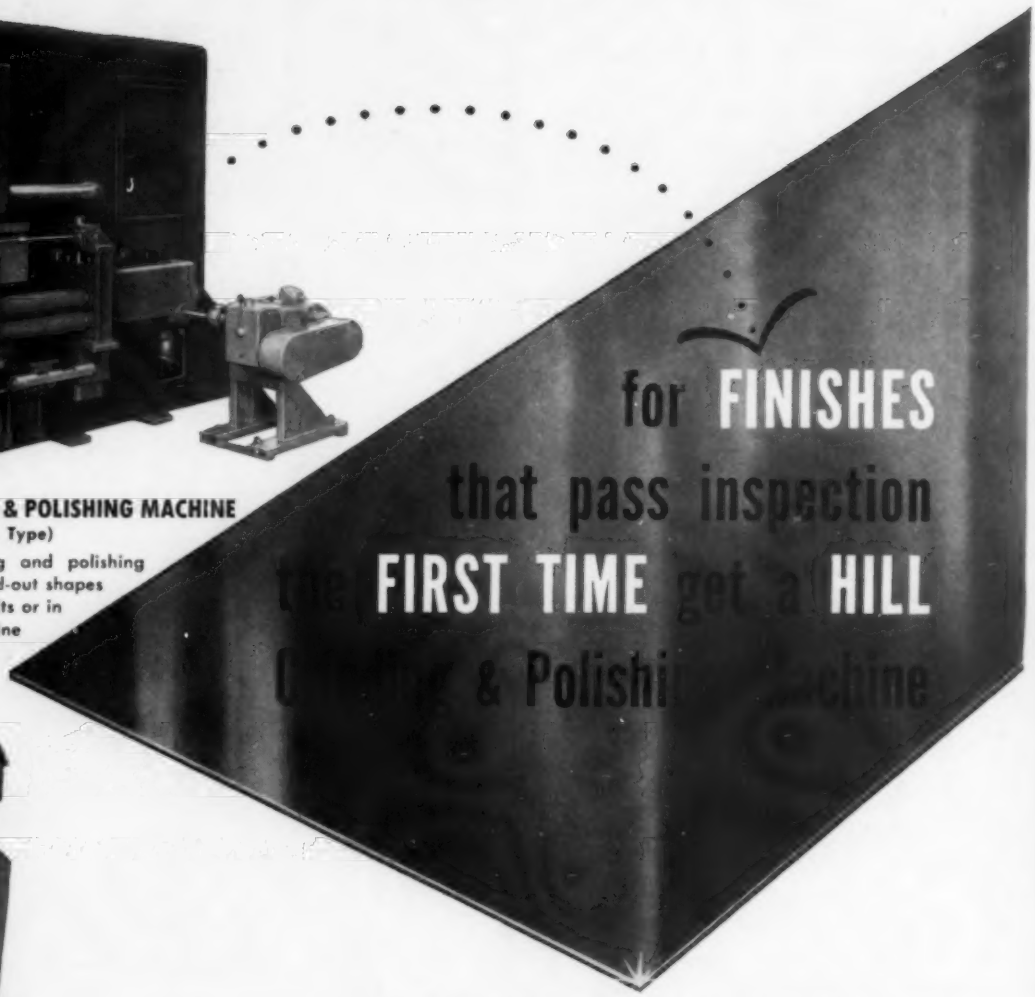


ABRASIVE BELT GRINDING & POLISHING MACHINE
(Pinch Roll Type)

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.

The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.



● HILL 2-ROLL Vertical Abrasive Belt Grinding and Polishing Machines are made in two general types for producing superior finishes on flat surfaces as required by manufacturers of a wide variety of products such as decorative plastics, auto bumpers, engravers plates, home appliances, etc.

Both types are built in polishing widths up to 60" and larger sizes can be furnished if desired. Your problem will be given our prompt and careful attention.

ABRASIVE BELT POLISHING MACHINE
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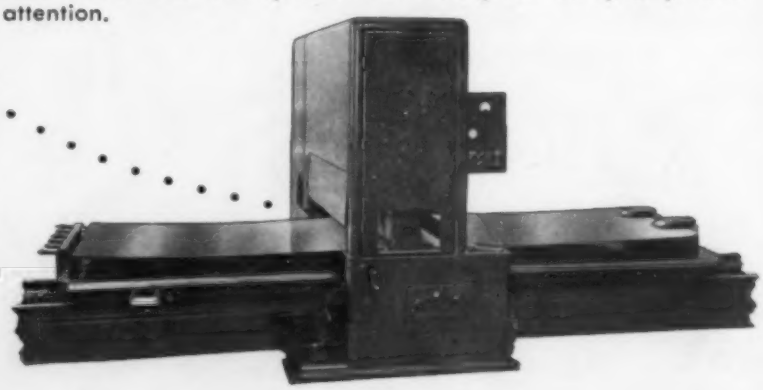
For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with full hydraulic reciprocating table.



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Why Standard Data?

Standard time data techniques are saving many thousands of dollars annually in progressive plants. They can be applied very consistently to grinding.

Before you're ready for a standard data development program for grinding, you may have to get rid of some mental reservations about grinding as a process. Those who have studied grinding in this way assure us there's nothing mysterious about it that makes it unsuitable for standard data development.

Who can use standard time data—just the biggest production shop, or the medium-sized shop, or the small one? The answer—all of them! The very largest companies of course can carry the technique to its fullest development. But standard data can be just as useful to the smaller shop. If anything, the smaller shop, or the one with short production runs, can best take advantage of the accuracy built into standard data, because their first production estimate has got to be right.

Perhaps in developing standard data for your grinding you will be only extending the use of a technique which has already proved its worth to you for other types of operations; or maybe this will be your first experience with this important method of production estimating.

Simply stated, standard time data are a family of time values for the elements that make up an operation. They're based on averages. Any repetitive cycle consists of elements which can be observed, described, timed and averaged to give a set of standard time data. Using the data involves putting together the proper elements and their time values to estimate the total time for a given operation. Practically all the "guess" is taken out of estimating in this way, and therein lies standard data's main value.

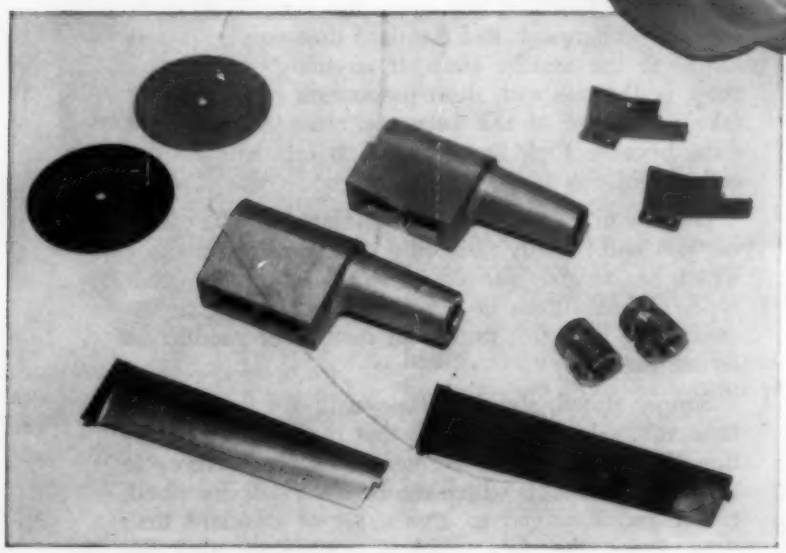
Don't be afraid of the word "average." After all, averaging was the method used by doctors to find out what the normal temperature of the human body is. The doctors simply read the temperatures of a great many people who said they felt all right, then averaged the readings to arrive at the well-known figure of 98.6°F. No one disputes its accuracy.

Take a good look at Ed Cyrol's article beginning on page 23. Then see where standard data fit into your cost reduction program for '57.

Jack Kenyon
Managing Editor

For Rapid Barrel Finishing

EXOLON Tumbling Abrasive



Various stamped, die cast, forged and screw machine parts before and after barrel finishing with EXOLON abrasives.

• More and more manufacturers are turning to barrel finishing for its big savings and uniformity over individual hand finishing.

Naturally, the process is only as effective as the abrasive used. In response to the demand for a fast-cutting, long-life abrasive, EXOLON has developed this super-hard aluminum oxide grain which is *barrel-finished itself* for non-scratch, precision smoothing of your metal surfaces.

May we barrel-finish some of your sample parts *at no obligation to you?* Or, if you prefer, we are prepared to furnish you trial lots of Exolon Barrel Finishing Abrasive at quantity discount for trial in your own barrel. You will find, as others are finding daily, that it gives you a superior finish at substantially lower cost. Write today!

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★ IN CLEANING UP
★ IN REMOVING BURRS
★ IN REMOVING SCALE

from:

- forgings
- metal castings
- metal stampings
- machined parts

which can be handled in the barrel.

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grinding ... finishing
OCTOBER 1956

Developing Standard Time Data for Grinding Operations

by **E. A. Cyrol**
E. A. Cyrol & Company
Management Consultants

Part 1–How to Establish Standard Data –Standard Data for Blanchard Operations

If your grinding operations aren't "nailed down" to a good set of standard time data, you probably don't have enough information for accurate cost and production estimating.

This article series does two things:

- *Shows how to establish standard data for your own operations.*
- *Gives representative standard data for operations on particular machines.*

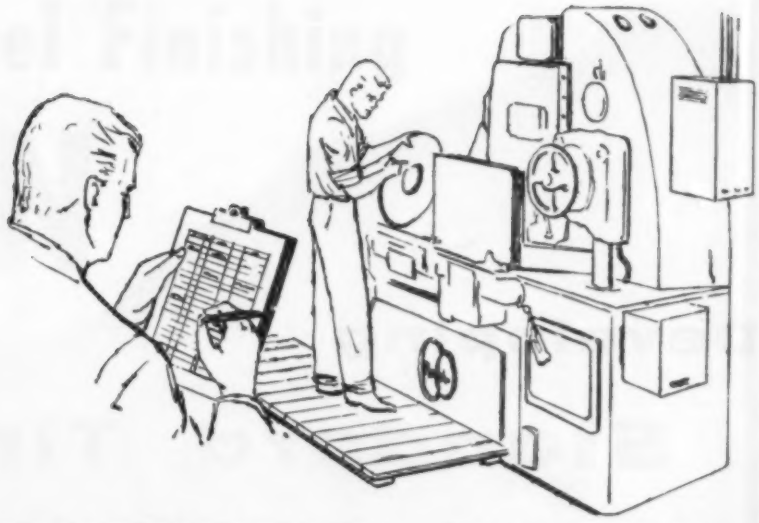
• Development of standard time data has been at the heart of cost reduction programs in progressive plants. It's a rare plant these days that does not have a set of standard data for its machining operations, and more and more shops are applying it to operations such as maintenance, which haven't previously been considered feasible to time study.

Without standard data, cost and production estimating is uncertain, scheduling and machine loading inaccurate. Incentive programs hinge directly on their accuracy. But with all the attention that has been focused on standards for most operations, grinding has been strangely neglected. There has been a reluctance to apply standards to grinding in the same way as has been done for other classes of machining. The lame excuse given in the majority of these cases is that grinding is an inexact type of process which can't be subjected to conventional time study methods and analysis.

Nothing could be farther from the truth. Since deriving standards for a particular operation is basically a seeking of average values, it follows that if you take enough readings and average them, with the application of horsesense, you'll come out with an answer that will represent a good standard time for the operation. This is true whether the operation is done on an engine lathe or a grinder, as has been borne out conclusively in all our studies.

The purpose of this article series is to show how you can develop usable standards for your own operations, and to give suggested time values that have been obtained as a result of our work in a number of shops. The actual time values given in this article should be regarded as recommended numbers, to serve as benchmarks for the actual studies you may make in your own plant.

5 Steps In ESTABLISHING STANDARD TIME DATA



1 **TIME STUDY THE OPERATION** with several operators over several days. Record all the work elements carefully, noting especially the end points. Time each element in the smallest time increment practicable, to the hundredth of a minute.

How Standard Time Data is

Advantages of Standard Data

It may be well to consider the advantages of using standard data over the single time study rate setting method.

Production standards based on standard data tend to be more consistent, for three main reasons: (1) Standard data are a composite of many studies. These averages are better than any of the individual values. (2) Exactly the same time is allowed in a standard for an element each time the element occurs in a work cycle. (3) Time for variable elements reflects the proportionate difference in time due to a physical difference in the part.

Standard data developed in the plant where they will be applied are easier to explain to employees, supervisors, and union representatives than the individual study method. And once the data are understood and accepted, they cease to be a source of trouble. Standard data seem to "make sense" because the employee has in his work experience unconsciously made such comparisons of one production standard to another. Standard data explain the differences readily and acceptably on the basis of differences.

The steps in establishing standard time data outlined and illustrated on these pages are relatively simple to follow. However, there are a number of points which should be emphasized in carrying out such a study and in applying it.

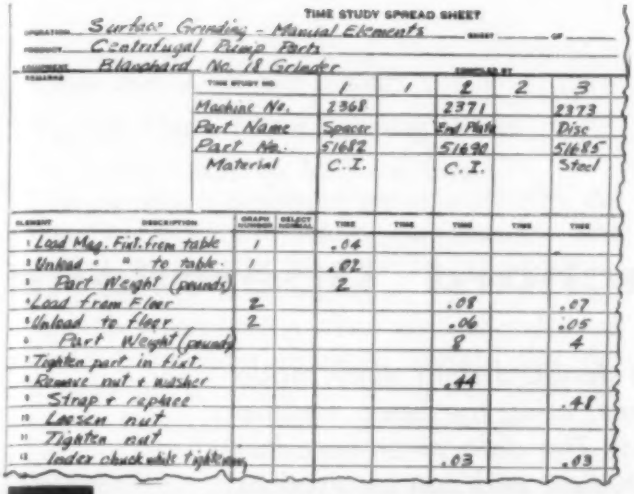
Taking the Time Study

Fundamental to the taking of time studies for developing standard time data is the accurate description of the elements that comprise the work cycle. The time study operator must clearly define these elements and their end points, or watch reading points, so that any future check time study will compare like elements with like elements. This written description is also necessary to insure that any future changes will be properly made. Unfortunately, the benefits of standard data are often lost because the elements have not been carefully defined and written down.

Another important point to be emphasized in taking the time studies is that a large number of studies—say, seventy-five to a hundred—must be taken to insure accuracy.

The Check Studies

Testing the standard time data must be done without prejudice; if shortcomings show up, they should be taken into consideration and the data revised and improved. A flaw ignored at this point



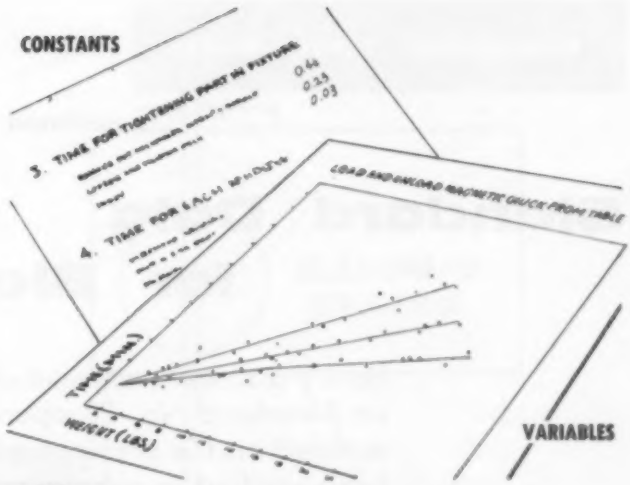
TIME STUDY SPREAD SHEET

Operation: Surface Grinding - Manual Elements
Product: Centrifugal Pump Parts
Machine: Blanchard No. 18 Grinder

Time Study No.	1	1	2	2	3
Machine No.	2368		2371		2373
Part Name	Spacer		End Plate		Disc
Part No.	51682		51690		51685
Material	C.I.		C.I.		Steel

Element	Description	Graph Number	Select Number	Time	Time	Time	Time	Time
1	Load Mag. Fixt. from table	1		.04				
2	Unload " " to table	1		.02				
3	Part Weight (pounds)			2				
4	Load from Floor	2				.08		.07
5	Unload to Floor	2				.06		.05
6	Part Weight (pounds)					8		4
7	Tighten part in fixt.							
8	Remove nut & washer					.44		
9	Strap & replace							.48
10	Loosen nut							
11	Tighten nut							
12	Index chuck while tightening					.03		.03

2 **POST THE TIME STUDY DATA to comparison ("spread") sheets so it can be easily analyzed. In this form, work elements which are constant and those that vary can be quickly spotted.**



3 **ANALYZE THE DATA to determine constant and variable elements. Chart the variables. At this point, look for possible methods improvements and incorporate them in the standard work cycle.**

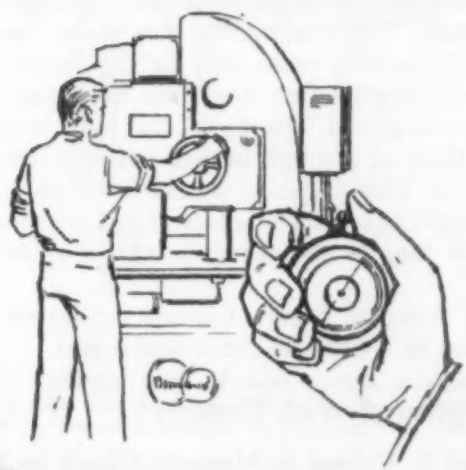
Established

will come up again and again to plague the man responsible for production standards.

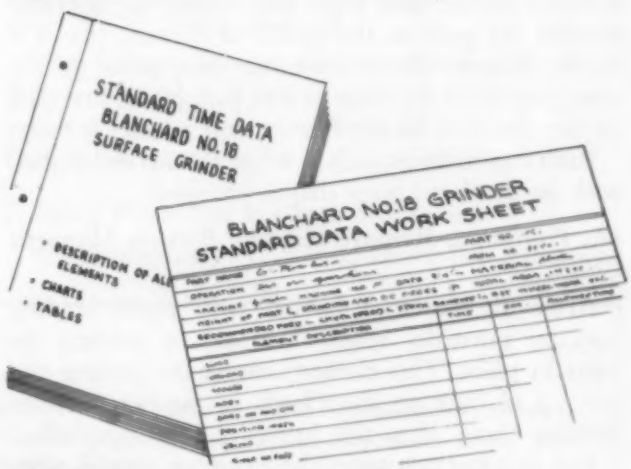
It's good to take the test studies of operations which weren't studied during the development of the data, as well as operations which were studied at that time. Usually about ten studies taken according to the original elemental breakdown will test the standard data. Of course, these studies should be taken of large parts and small parts; operations having many and just a few elements should also be included. This is important so that the entire range of data is proven ahead of its "bath of fire" when it is released to the shop as production standards.

The Standard Data Work Sheet

The work sheet merits special attention. One of the many advantages of standard data is the efficiency with which a good production standard can be determined. But this efficiency depends on a well-designed work sheet. A properly designed work sheet can reduce by about a third the time required to determine a standard, prepare a set-up card, and make out a tool list. Several examples of convenient work sheets will be given throughout this article series.



4 **PERFORM A CHECK STUDY to determine the validity of values found in (3). This will also establish time values for the new elements resulting from methods changes.**



5 **WRITE UP THE STUDY in permanent form, including detailed element descriptions, tables of time values, etc. Prepare standard data work sheets for finding total time for an operation.**

continued

Standard Data for Blanchard Operations

Here's a sample write-up of a standard data study made on Blanchard No. 18 operations, using the basic method outlined on the previous pages. The data given here has been verified in subsequent studies, and can be used as a guide for your own standard data development.

Production standards applied to Blanchard grinding operations can be correct for the "average" conditions only. The castings as they come from the foundry cleaning room vary to the extent that a standard may be "too loose" for the exceptionally good casting and "too tight" for the casting that is too thick or is rough so that excessive clean-up is necessary. This variation should come only in the grinding time only. The manual times are considered valid as long as the elements remain as described here.

The sketch in Figure 1 shows the layout of the machine in relation to the material area.

Description of Work Elements

1. Load & Unload to Magnetic Chuck or Fixture from Floor

The time for this element was found to vary as the weight of the casting handled. Table 1 gives the time as it increases with the weight. The time includes all the time from the instant the operator touches the part on the chuck or fixture, places it on the floor or flat or in a tote pan, picks up the next piece from the floor or tote pan, places that part on the chuck or on the fixture, and releases it there.

Parts over sixty pounds in weight are to be handled with an overhead hoist that is provided.

1A. Position & Remove Holding Bars on Magnetic Chuck

After the chuck is loaded with parts, holding bars are normally required to aid in holding the parts in place. This element covers the getting and placing of bars on the chuck in position and removing them after the grinding is accomplished.

For best performance, the operator should place the bars on the shelf at the rear of the machine (between the motor housing and the rear splash guard) or on the table alongside the machine at the left.

2. Load & Unload Magnetic Chuck or Fixture from Table

This time also varies according to weight of the part and is given in Table 2. This time includes all time from the instant that the operator's hands touch the part, remove the part to the table, pick up the next part from the table and place it on the chuck or position it in the fixture. In the time study observations, the watch was read at the moment when the hands let go of the part.

In both of the above elements, more than one part may be loaded or unloaded at the same time. Several pieces may be placed on the chuck and then arranged in positions to be best held by the magnetic field. When this was done, the watch reading was made when the last piece was positioned and the operator began reaching for the holding blocks or the wrench to tighten the holding device on the fixture.

3. Remove Nut & Washer, Spacer or Strap & Replace

When a fixture is used, a nut may be needed to hold the part fast in the fixture. The time given in Table 3 includes the time for removing and replacing a washer or spacer or strap—or spacer and washer or strap and washer. The nut is completely removed and set aside either on the chuck or table. This includes also the time required to pick up the wrench and set it aside.

4. Loosen and Tighten Nut Only

When a nut does not have to be completely removed but merely loosened and tightened, the time of 0.23 minute was found to be correct. An illustration of how these time values add up can be had by taking an actual time study of Part No. A-3550 Water Outlet Connection. Elements 2, 3, 8, and 9 are the positioning and securing elements. For 16 pieces the time amounts to 3.24 plus 1.04 plus 0.86 plus 1.07 or 6.21 minutes. From tables 1,

2 and 3, we get the following: 16 x .12 plus 15 x .03 plus 16 x .23 or 6.05 minutes.

5. Position Chuck Under Grinding Wheel

(Parts held on Magnetic Chuck)

This element is performed immediately after the loading and placing of holding bars elements. The work is brought under the wheel for the first time. The operator must exercise some care not to hit an oversized part with a wheel segment and cause damage. Some experimentation showed that the best procedure is to raise the wheel well above the work, feed the chuck under the wheel rapidly, and lower the wheel to the work slowly. The chuck should revolve at its highest speed during this time—33 R.P.M.

This element has all time required from the instant that the holding bars are positioned to the time when the wheel is lowered to touch the work. The chuck R.P.M. is reduced and the coolant is started after the wheel makes its initial contact with the work, or, during the "grinding time."

6. Position Chuck under Grinding Wheel

(Parts held in Fixture)

This element is exactly the same as the element above except that the part or parts are held in a fixture instead of the magnetic field of the chuck.

6A. Grinding Element

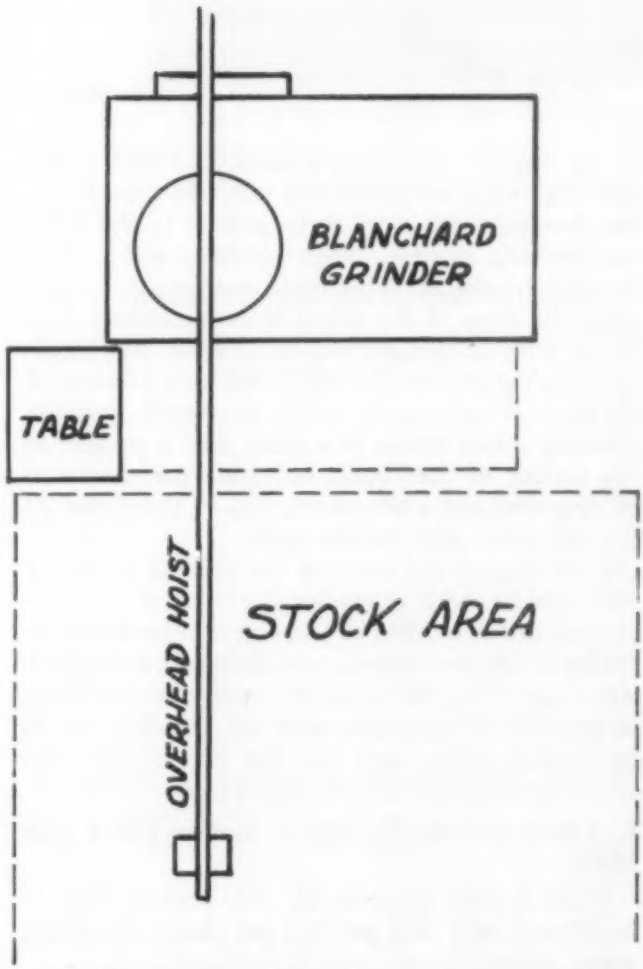
The downward feed of the machine is clearly indicated on the column of the machine in thousandths of an inch per minute. The following feeds are available: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, and 76.

The following R.P.M.'s of the chuck are available: 6, 9, 12, 18, 25, and 33.

Only guiding rules can be given. The graph in Figure 2 shows the approximate relation between the area of metal ground and the feed that can be used. This, of course, is only a guide. The highest feed should be used without burning the work and without overloading the machine as shown by the amperes of current drawn by the motor during grinding.

Throughout the period of time study, an 18-inch, 8-segment A-24-J8 aluminum oxide wheel was used.

Although wheel wear cannot be definitely established, it is suggested that 0.015″ be considered worn off the wheel for every 0.125″ removed on a cast iron surface. In the case of steel forgings, it is suggested that 0.050″ be considered worn off the wheel for every 0.125″ metal removed.



1. WORK STATION LAYOUT shows position of machine in relation to table and stock area. Workpieces over sixty pounds in weight are moved to machine by overhead hoist from stock area.

The formula for grinding time is as follows:

$$\frac{\text{Stock Removed} + \text{Wheel Wear}}{\text{Feed in Thousandths Per Min.}} = \text{Minutes of Grinding Time}$$

7. Bring Work Out to Check Dimension

It is sometimes necessary to check the dimension

E. A. Cyrol

Ed Cyrol, in his work as a management consultant specializing in the field of work measurement, has been cited by the University of Michigan for his outstanding contributions to industrial engineering. His previous articles in GRINDING and FINISHING, published in the first four issues of the magazine, aroused much favorable comment from our readers. It is hoped that this series, representing the results of further studies and incorporating their refinements, will be equally well received.

continued

of the parts or part being ground. The feed of the grinding wheel is sufficiently exact to permit any but close tolerance work to be ground to size without checking. However when tolerances within .005" to .010" are required, the part must be checked because the wear of the wheel is indeterminate. The chuck must be brought out from under the wheel, the splash guard moved out of the way, and one of the parts on the magnetic chuck measured. Since the grinding wheel moves in a plane that is parallel to the surface of the chuck, only one part needs to be measured and a safe assumption be made that all the rest of the parts are the same.

Table 4 gives the time for the element to "bring work out to check dimension." The time varies according to the number of parts on the check and includes all the time necessary to disengage feed, move wheel up, allow the chuck to revolve several times to permit a certain amount of the grinding grit to be washed away, feed out the chuck, open the splash guard, pick up scale and measure.

8. Check with Profile Gage or Scale or Check with Mikes

Table 5 gives the time for this element. It is to be allowed only once per load per check for reasons given above.

9. Reposition Chuck under Grinding Wheel after Checking

The time for repositioning the chuck under the grinding wheel after a check was found to be constant time of 0.18 minute. This includes bringing the work back under the grinding wheel, feeding the wheel down to the work, closing the splash guard, starting the coolant, and engaging the automatic feed.

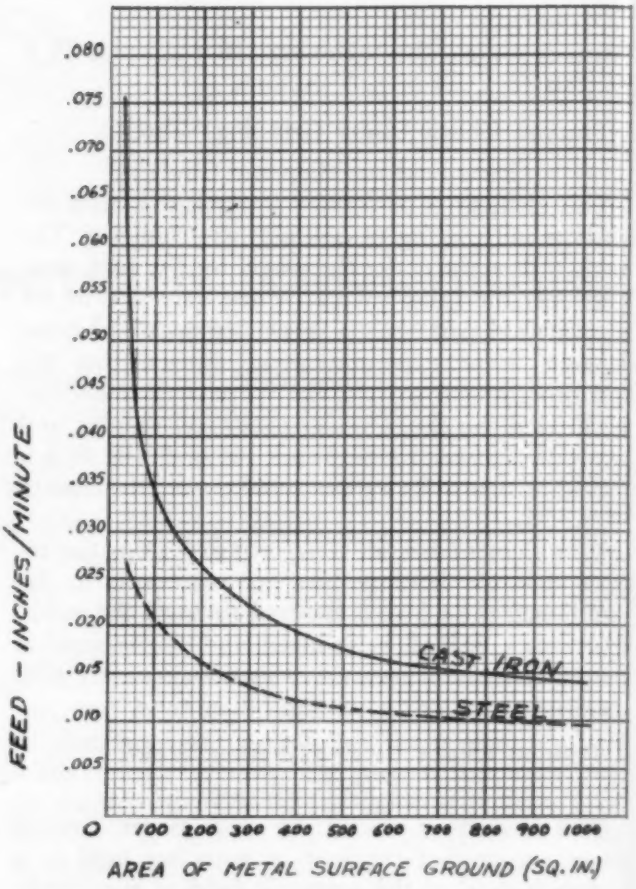
10. Bring Work Out for Unload

This element is very similar to the element of bringing work out to check; however, this element allows additional time for washing the parts with coolant more thoroughly than in the previous element. It was found that this time varies according to the number of parts on the chuck.

This element does not cover time required to wash out grit in a part such as the mixer valve manifold. This part has only one side open and fills completely with coolant and grit. It must be rather carefully slushed out.

11. Clean Chuck

After a load of parts is ground to size and removed from the chuck, the chuck must be cleaned. The usual procedure for this operation is to flood the chuck with coolant and then bring the chuck



2. APPROXIMATE FEEDS used for steel and cast iron during study of Blanchard operations. Calculation of the actual grinding element can be done using curves like this and the known wheel breakdown diagonal stock removal rates for the operation.

out to where the operator can wipe the chuck with a rubber strip about 10 inches long. The wiping is done in a spiral fashion—starting at the center of the chuck and spiraling out to the edge where the grit and trapped coolant is forced off the chuck into the pan.

12. Set-Up

Very little set up is required for the Blanchard grinder.

13. Punch In & Out

After a job is complete, the operator marks his ticket with the production completed, goes to the dispatcher's booth for a new job, gets his new assignment and returns to work. He may measure a part to check the amount of stock to be removed before he starts in to work. This time was found to be about 3 minutes per occurrence. Adding 7.9% allowance gives 0.054 hour. For simplicity in record keeping, the time adopted will be **0.06 hrs.**

14. Position Fixture on Chuck & Level

When a fixture is required, the operator will have to place it on the chuck with hoist in most instances. This time is (3.00 min. + 4.00 min.) x 107.9% or **0.125 hrs.** The 3.00 minutes is for punch In & Out as above. Use **0.13 hrs.**

BLANCHARD GRINDER STANDARD DATA SHEET

PART NAME				PART NO	
OPERATION				OPER NO	
MACHINE	MACHINE NO	DATE		MATERIAL	
WEIGHT OF PART	GRINDING AREA/PC	PIECES/LOAD		TOTAL AREA	
RECOMMENDED FEED	CHUCK SPEED	STOCK REMOVED		EST WHEEL WEAR	

ELEMENT DESCRIPTION	TIME	OCC.	ALLOWED TIME
LOAD & UNLOAD - FF - TT - FIX (HOIST 0.9#)			
SECURE			
INDEX			
BARS ON & OFF			
POSITION CHUCK UNDER WHEEL			
GRIND			
GRIND - NO FEED			
FEED OUT TO CHECK			
CHECK			
REPOSITION UNDER GRINDING WHEEL			
BRING WORK OUT (WASH)			
CLEAN CHUCK			

DOWN TIME ALLOWANCE	MINUTES	TOTAL ACTUAL TIME PER PIECE	
PERSONAL	20.00	PLUS _____ % ALLOWANCE	
UNAVOIDABLE DELAY	15.00	TOTAL ALLOWED TIME/LOAD	
MISCELLANEOUS		STANDARD HOURS PER PIECE	
		SET UP TIME IN HOURS	
TOTAL DELAY TIME		DATE STANDARD ISSUED	

REMARKS	SET UP DATA	STD. HOURS
	NO FIXTURE USED	
	FIXTURE USED NO. _____	
	LOWER WHEEL (8 SEGMENT)	
	CHANGE WHEEL	
	CLEAN MACH &CHANGE COOLANT	

OLD SETUP STD.____OLD RATE____NEW SETUP STD.____NEW RATE:____CALCULATED BY____

3. STANDARD DATA WORK SHEET developed from the Blanchard study for use in production estimating. Efficiency of standard data system depends on well-designed work sheet.

15. Lower Wheel

As the grinding wheel is used the segments are reduced in length through wear and dressing. When the segments become too short for further use, they must be lowered. The time for this is (10.00 min. + 3.00 min. x 107.9%) 14.03 minutes or 0.23 hours.

The operator is permitted to punch in and out on this job and report his time.

16. Clean Machine

Whenever necessary, the Blanchard Grinder must be cleaned of the accumulated sludge and the coolant consisting of water and soluble oil must be changed. The oil is brought to the machine by the operator by bucketfuls from a point about 30 feet away where it is stored in a drum. The water is piped directly to the machine.

The operator is allowed 63.00 minutes for this operation. This time permits him to get empty barrels from the yard—some wait and search for barrels allowed—and make all necessary preparations. The standard allowed is (63.00 x 107.9%) or 1.13 hrs.

17. Change Grinding Wheel

After a grinding wheel is completely used up, the operator removes the worn-out wheel and replaces it with a new one. The time for wheel change given here is good only for the 8 segment wheel that was used during our time study observations.

The time of 15.44 includes 3.00 minutes for checking in and out and get ready as well as getting the new wheel, cleaning the machine after the change-over, and cleaning the area near the machine.

The standard for a wheel change is (15.44 min.) 0.26 hrs.

Time Values for Blanchard Grinding Elements

1. LOAD & UNLOAD TO MAGNETIC CHUCK OR FIX. FROM FLOOR

Wt.	Time	Wt.	Time	Wt.	Time
2	.11	22	.19	42	.27
4	.12	24	.20	44	.27
6	.13	26	.21	46	.28
8	.14	28	.21	48	.29
10	.14	30	.22	50	.30
12	.15	32	.23	52	.30
14	.16	34	.24	54	.31
16	.17	36	.24	56	.32
18	.17	38	.25	58	.33
20	.18	40	.26	60	.34

2. LOAD & UNLOAD MAGNETIC CHUCK FROM TABLE

Wt.	Min.	Wt.	Min.	Wt.	Min.
2	.06	22	.13	42	.20
4	.07	24	.14	44	.21
6	.07	26	.14	46	.21
8	.08	28	.15	48	.22
10	.08	30	.16	50	.23
12	.09	32	.17	52	.24
14	.10	34	.17	54	.24
16	.11	36	.18	56	.25
18	.11	38	.19	58	.26
20	.12	40	.20	60	.27

3. TIME FOR TIGHTENING PART IN FIXTURE

Remove nut & Washer or Strap & Replace	0.46 Each
Loosen & Tighten Nut Only	0.23 Each
Index Chuck While Tightening	0.03 Each

4. POSITION & REMOVE HOLDING BARS ON MAGNETIC CHUCK

No. of Bars	Total Min. Allowed	No. of Bars	Total Min. Allowed
2	.19	18	1.05
3	.25	19	1.10
4	.28	20	1.18
5	.31	21	1.26
6	.34	22	1.34
7	.36	23	1.43
8	.39	24	1.51
9	.43	25	1.58
10	.49	26	1.67
11	.55	27	1.75

continued

12	.61	28	1.85
13	.68	29	1.95
14	.76	30	2.04
15	.81	31	2.10
16	.88	32	2.24
17	.95		

5. POSITION CHUCK UNDER GRINDING WHEEL—PIECES ON CHUCK

No. of Pcs.	Min.	No. of Pcs.	Min.
1	.30	31	.41
4	.31	34	.42
7	.32	37	.43
8	.33	40	.44
10	.34	43	.45
13	.35	46	.46
16	.36	49	.47
19	.37	52	.48
22	.38	55	.49
25	.39	58	.50
28	.40	60	.50

6. POSITION CHUCK UNDER GRINDING WHEEL—PIECES IN FIXTURE

No. of Pcs.	Min.	No. of Pcs.	Min.
1	.26	9	.29
2	.26	10	.29
3	.27	11	.29
4	.27	12	.30
5	.27	13	.30
6	.28	14	.30
7	.28	15	.31
8	.28	16	.31

7. BRING WORK OUT TO CHECK DIMENSION

No. Pcs. on Chuck	Min.	No. Pcs. on Chuck	Min.
2	.11	34	.15
6	.12	38	.16
10	.12	42	.17
14	.13	46	.17
18	.13	50	.18
22	.14	54	.18
26	.14	58	.19
30	.15	60	.19

8. CHECK WITH PROFILE GAGE OR SCALE **0.14 Min.**

(Allow only once per load per check)

Check with mikes (Depth)	0.50 Min.
Check with mikes (O.D.)	.21 Min.
Check with mikes (I.D.)	.27 Min.

9. REPOSITION CHUCK UNDER GRINDING WHEEL AFTER CHECKING **.18 Min.**

10. ALLOWED TIME FOR "DWELL" OR "SPARK OUT"

(Area Being Ground = Total Area = No. Pcs. x Area of Pc.)

Area Sq. In.	Min.	Area Sq. In.	Min.
20	.17	320	.56
40	.20	340	.58
60	.23	360	.61
80	.25	380	.63
100	.28	400	.66
120	.30	420	.68
140	.33	440	.71
160	.35	460	.74
180	.38	480	.76
200	.41	500	.79
220	.43	520	.81
240	.46	540	.84
260	.48	560	.87
280	.51	580	.89
300	.53	600	.92

11. BRING WORK OUT FOR UNLOAD

(Time allowed for washing & grinding grit off Parts with coolant)

No. Pcs. on Chuck	Min.	No. Pcs. on Chuck	Min.
1	.35	32	.46
2	.35	34	.47
4	.36	36	.47
6	.37	38	.48
8	.38	40	.49
10	.38	42	.49
12	.39	44	.50
14	.40	46	.51
16	.40	48	.52
18	.41	50	.52
20	.42	52	.53
22	.42	54	.54
24	.43	56	.54
26	.44	58	.55
28	.45	60	.56
30	.45		

12. CLEAN CHUCK **0.31 Min.**

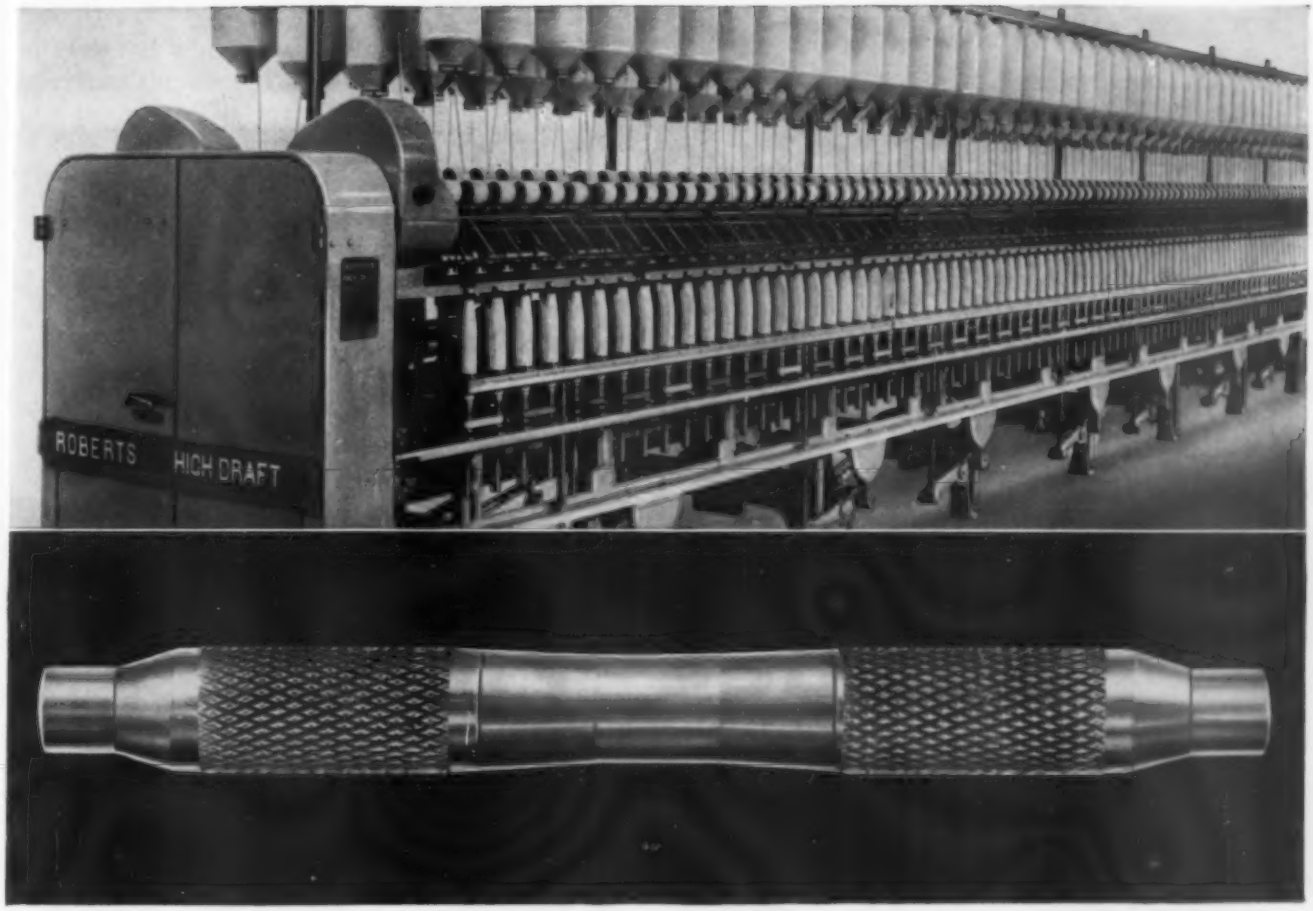
13. PUNCH IN & OUT **3.00**

14. CLEAN MACHINE—REMOVE WATER & OIL—REMOVE SLUDGE —Add NEW WATER & OIL **60.00**

15. POSITION FIXTURE ON CHUCK & LEVEL **4.00**

16. LOWER WHEEL **10.00**

End of Part 1. Subsequent parts will give data on external cylindrical grinding, including center type, centerless, and center lapping, on specific makes and models of machines.



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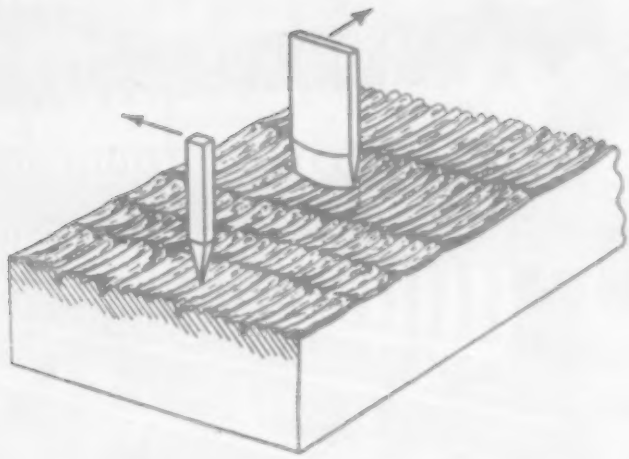


Significance and Measurement of

Surface Finish

by **R. E. Reason,** Director of Research
Taylor, Taylor and Hobson Ltd.
Leicester, England

Part 2

How transducers affect instrument performance

How to select proper cutoff values

Continuing the informative three-part article by the designer of the famed British "Talysurf" instruments.

Last month the author discussed how surface irregularities originate and what they're like. He also discussed the selection of finishes for various applications and introduced the subject of stylus instruments.

Next month the author describes the interference method, which is becoming increasingly important as finer and finer finishes must be evaluated.

Types of Transducers

Coming now to transducers, figure 12 shows some of the devices that have been used for converting the movements of the stylus into an electrical potential or current for operating a recorder or integrating instrument. Figure 12a is the system that has been used in the Talysurf for a long time—we call it a "modulated carrier" system. The stylus is mounted on the end of an armature which on being tilted, varies differentially the air gaps of two inductances, one on each side of a pivot. The inductances are connected in a bridge circuit fed from an oscillator, which supplies the carrier current. The output from the bridge varies (i.e. is modulated) in proportion to the inclination of the armature. The frequency of the carrier is high relative to the speed with which the stylus is moved up and down, and the system functions just like a little radio system—a carrier is modulated, transmitted (in this case by land line)

to a receiver where it is amplified, and demodulated to extract the wanted signals which are fed into the pen recorder. The great advantage of this system is that every movement of the stylus can be reproduced, however slowly it may take place.

In another device, long used in America, a coil driven by the stylus moves through a magnetic field, figure 12b. The moving coil being a device which generates a current according to the velocity of its movement, a correcting circuit is used to make the output dependent only on amplitudes; but this can work only for frequencies above a certain value. For lower frequencies there is little or no output. The device is not used for recording, but is very suitable for average measurement, of which something will be said presently.

Use has also been made of piezo-electric devices (figures 12c) in which the flexure of a piece of rochelle salt or barium titanate produces a potential proportional to the strain in the material, which after amplification can be utilized to operate electrical recording and integrating instruments. These devices tend to behave rather like a moving coil, because although in simple theory the potential should be maintained for as long as the crystal is strained, in practice the minute electric charge quickly leaks away. These devices are not ideal for making records, because if the up and down movements of the stylus are slow enough they may not be fully reproduced and we may miss from the graph something that we ought to be seeing.

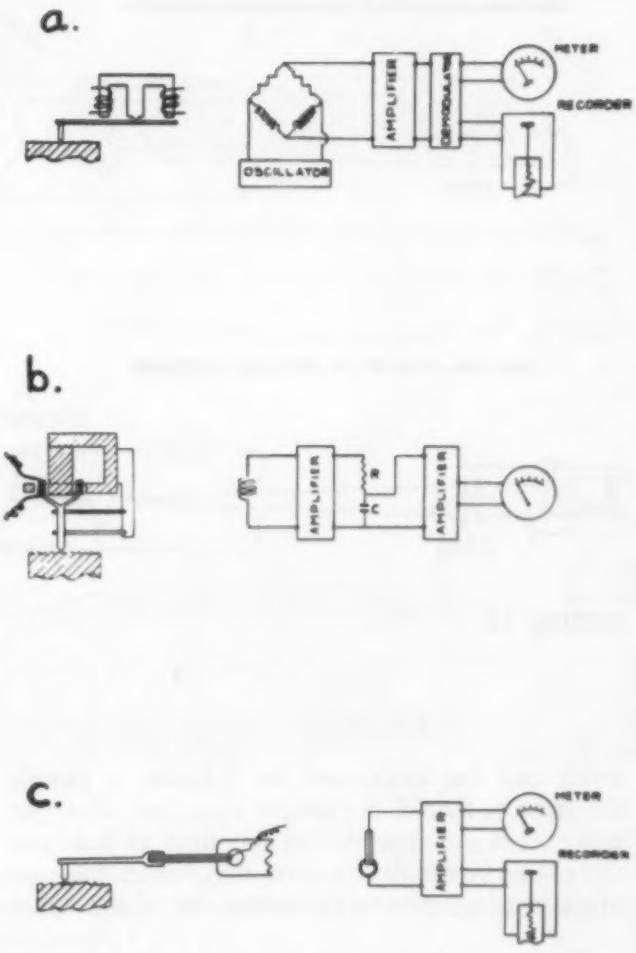


FIGURE 12 ►

Principles of the Systems

Now, the electrical principles of these systems need not worry us very much because their performance can be precisely represented by equivalent mechanical levers.

The modulated carrier system is the equivalent of a rigid lever which simply magnifies the movements of the stylus (Figure 13), though you have to imagine that the lever is so light that it can magnify with a ratio of one-hundred-thousand to one even though the operating force is but a few milligrams. The moving coil and the piezo-electric devices (generator devices) are the equivalents of a lever which is maintained in a mean position by a spring and displaced by the stylus acting through a dashpot filled with oil. When the up and down movements are fast enough, the oil acts as a rigid coupling between the

About the Author

Richard E. Reason, an Associate of the Royal College of Science, joined Taylor, Taylor and Hobson in 1925, having been a student at Imperial College, England.

In 1935 he started a major research into the nature and measurement of surface finish. After long research, Reason and his staff came to the conclusion that although optical methods are of great value, graphical representation of the movement of a fine diamond stylus could form the most practical means of calibrating the majority of surfaces. To do this, a means of averaging the readings of the vertical movements of the stylus was necessary.

Reason evolved geometric standards to which these instruments could work, and designed the "Talysurf" instrument. The standards which he suggested have been very widely adopted in the United Kingdom and in the U.S., as well as in many other countries.

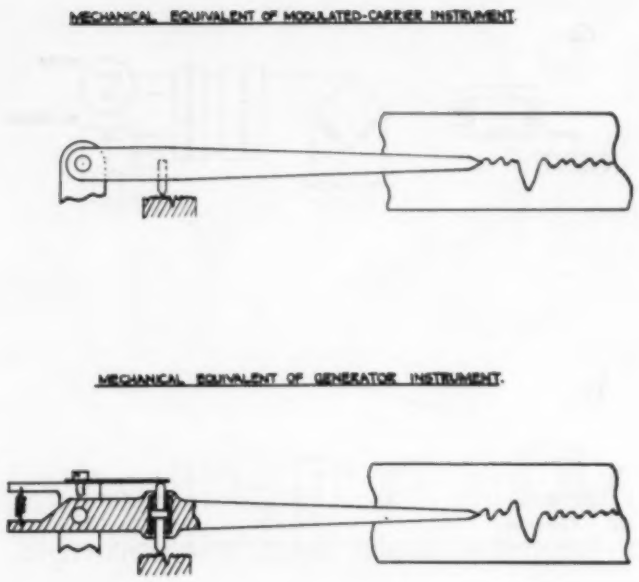


FIGURE 13

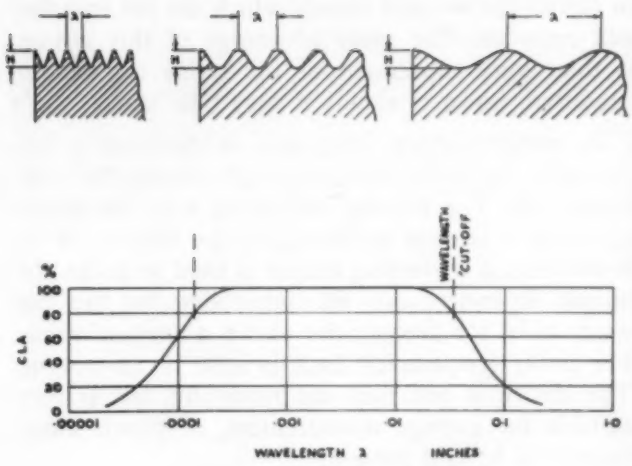


FIGURE 14

stylus and the lever, and the behavior is exactly the same as that of the simple lever, but when the movements are slow the oil has time to leak past the piston in the dashpot and the pointer may not move in proportion to the movement of the stylus.

The practical effect of the dash-potted lever is shown in figure 14. Imagine a number of sinusoidal profiles, all of the same height, but with progressively increasing wave-lengths say from .00001″ upwards. They are traversed by the stylus and we observe in each case the height of the recorded graph. This height is then plotted against wavelength to give the curve in figure 14. If the lever ratio is M the height should be M times the height of the original profile. At first there is no response because the stylus is too wide to enter the scratches. Then we shall find a region where the stylus begins to enter the scratches and we get a partial representation; presently, when the wavelength is greater than two or three times the stylus width we shall get a full representation regardless of wavelength; but eventually the representation will begin to fall off again because the dashpot has come into action and is failing to convey the full movement of the stylus to the lever.

How Cutoff Values Affect Readings

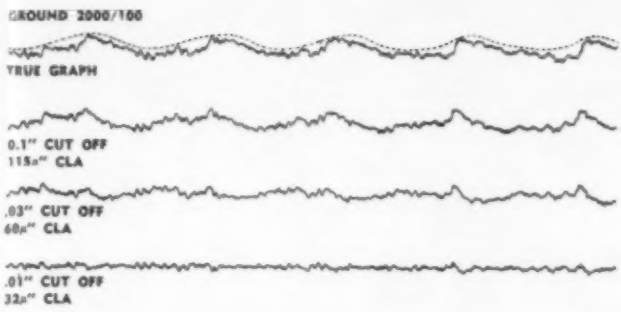
We may call the wavelength at which we get a significant attenuation, say 20% attenuation, 80% of the full response, the cut-off wavelength of the instrument. To wavelengths longer than that it is not usefully responsive. For wavelengths shorter than that it gives a substantially full response right down to the finest texture with which this stylus can cope.

Although it is not desirable to have a long wavelength cut-off in a graphing instrument, it will be shown presently that that is just what is wanted for averaging instruments, for which purpose the generator type of pick-up is therefore entirely suitable. When a modulated-carrier pick-up is used, it can be given this type of characteristic by switching in what is called an electric wave filter.

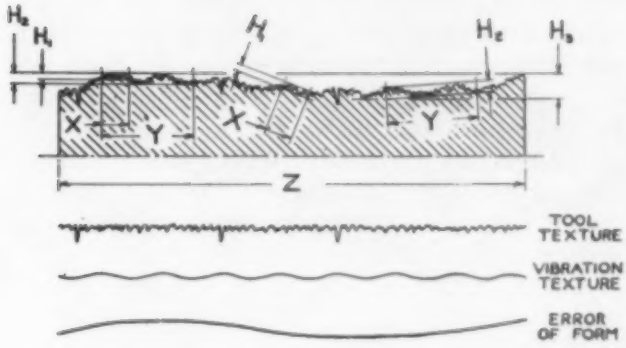
The action of a wave-filter in passing wavelengths less and rejecting those greater than its cut-off value is shown in figure 15. At the top, we see the original wavy ground surface in which everything has been produced. Below it, a wavefilter having 0.1″ cut-off has been brought into action, but its cut-off is greater than the crest spacing of the waves (.06″) and the reproduction is practically unaffected. Next, a cut-off of .03″ is used; this is less than the crest spacing and the wave is largely suppressed. If we use a still shorter cut-off (.01″) we get the graph down at the bottom, which shows the closely spaced scratch marks separated entirely from the wavy secondary texture. We could feed any one of these wave-forms into an average meter, and this brings us to the question of numerical assessment which must now be considered.

Measuring the Profile

So far we have considered only the graphic repre-



▲ FIGURE 15



▲ FIGURE 16

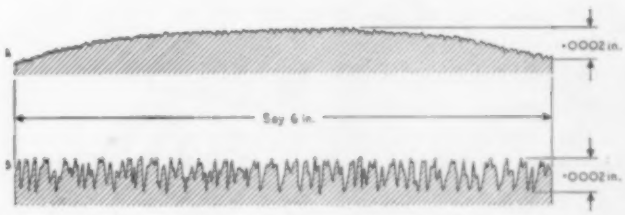


FIGURE 17 ►

sentation of the profile of the surface; but for workshop purposes we have to measure the profile in some way. We have to extract from it a number which can be written on a drawing—and in practice this is found to be quite a tricky problem, because of the enormous variations which are found in the size of the surfaces to be measured and the size of the irregularities on them, because of the many aspects of the irregularities which might be selected for measurement—for example height, spacing, slope of flanks, concepts of "bearing area", and because of the many ways in which each might be measured. To simplify the problem, arbitrary decisions based on what is found to be practical have to be taken, and without going into details, it can be said that one practical basis that has stood the test of time is to measure the height of all the irregularities found within a sample of the surface of specified length. Because the irregularities are themselves often not uniform in height, some form of averaging has to be accepted; but for a moment we can ignore this and discuss the effect of the size of the sample, with reference to a simple height measurement taken from the highest peak to the lowest valley. Figure 16 represents a surface which is afflicted with an error of form, with chatter marks, and with the normal scratch texture of a grinding process. If we consider the whole length of the surface we can measure the thickness H3 of a band normal to the surface that would contain all the irregularities of all kinds, but it is questionable whether such a number would have any real meaning, for it would fail to distinguish between the surfaces A and B in figure 17, which surfaces would have very different functional properties.

Further Analysis of the Surface

It is more purposeful to analyze the surface a little and distinguish at least between the error of form and the various kinds of texture that are found on it, and measure these quantities separately. We can do that by confining our attention to a comparatively small sample of surface—e.g. if we measure, for our purpose, over a length 'Y' we should get for the height of the band some value 'H_2'—and that will describe the irregularities due both to the waviness and to the abrasive process itself. If we take a short length 'X' then we shall find a smaller value H_1 describing the scratch marks alone. If the surface is reasonably uniform, it will not matter very much whereabouts we pick our sample, though for safety it might be as well to choose and average several samples. We can control the size of the sample, in an electrical instrument, by switching in a wave filter having a cut-off wavelength equal to the required size of the sample.

Selection of Cutoff Values

It should now be quite clear that if we are going

to measure a surface and be in agreement with someone else measuring the same surface we must first agree amongst ourselves what length of sample shall be taken into account, for if one person elects to measure over a length say X while another measures over a length Y they may get very different numerical results and, for lack of proper understanding, start quarreling. We must be absolutely clear about the length of surface over which we are going to take our measurements.

Unfortunately the same length will not serve for all purposes. In single point machining the length must be at least equal to the traverse feed, which may vary from ten-thousandths to tenths of an inch. It must also be less than the whole length of the part, which may amount to but a few hundredths of an inch (as piston rings). For this reason, many averaging instruments today offer more than one cut-off valve. For instrumental convenience, and to avoid confusion, it has been found best to have a standard series of cut-off valves. The series now accepted in America and in Great Britain is .003″, .01″, .03″, 0.1″, extendable in either direction.

In practice it is best not to depend on a single measurement, but to take the grand average of a number of adjacent samples, in order to make sure that local fluctuations are evened out. For example, the Talysurf instrument, when taking average readings with .03″ cut-off, automatically takes five consecutive samples into account, and I believe that the Profilometer, also having about .03″ cut-off, takes rather more than this number as it is traversed over a long length of surface, because of the 'memory' of its rather heavily damped meter. But the length of the basic sample remains the same, and in the average reading waves of greater length than the length of the sample are ignored however far the instrument is traversed.

Now I have been talking about 'average' measurements for some minutes, and we must pass on to what this means. If the surface irregularities were always repetitive in pattern, and merely fluctuated a little in height from place to place, it would suffice simply to measure the height of a few successive peaks from the adjacent valleys and take the average peak-to-valley height as our measure of surface finish. Unfortunately all abraded surfaces, as you will have noticed, are so irregular that a more complex type of averaging is called for. Many proposals have been put forward and tried. Some have been unduly complex, others have not lent themselves to instrumentation—the latter a most important consideration.

Averaging Standards

The method of averaging now standardized both in America (ASA B46 - 1955) and in England (BS 1134 - 1950) is shown in figure 18.

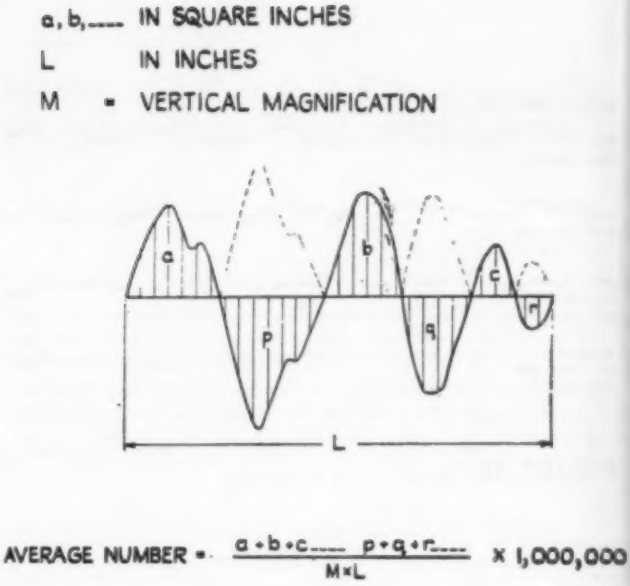


FIGURE 18

We take the assigned length of surface and draw a **centre line** through the waveform so that the areas under the curve and above and below the centre line are equal, and then measure the average departure of all points on the curve from that centre line. This value is called the Arithmetic Average (AA) value in America, and the Centre-Line-Average (CLA) Index in England. It has the virtues that it has a recognized mathematical definition, that it can quite readily be measured from a profile graph with the aid of a planimeter, and that it can also be measured by means of electrical integrating instruments, I think more readily than any other quantity.

For a long time the quantity used in America was the 'Root Mean Square Value'—the square root of the average of the squares of the ordinates—which gives numerical values from 10% to 30% greater than the centre line average value, according to the waveform. But while the r.m.s. value is a normal measure for electrical engineers, because it is a true measure of the power conveyed by an alternating current, it has no corresponding meaning in surface measurement, and after much thought and discussion, it has given way to the simpler arithmetic average value.

To summarize, England and America now have a common standard for assessing surface finish, such that all instruments constructed to measure according to the formula will give the same readings on a given surface regardless of differences in design

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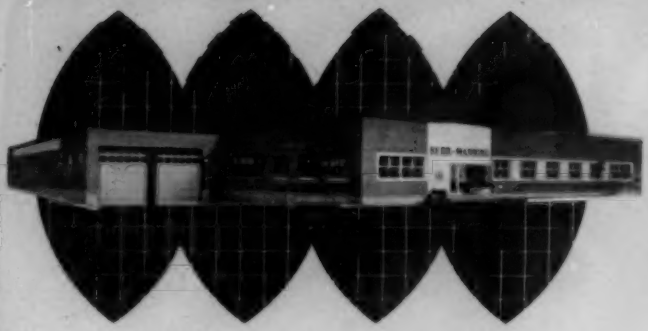

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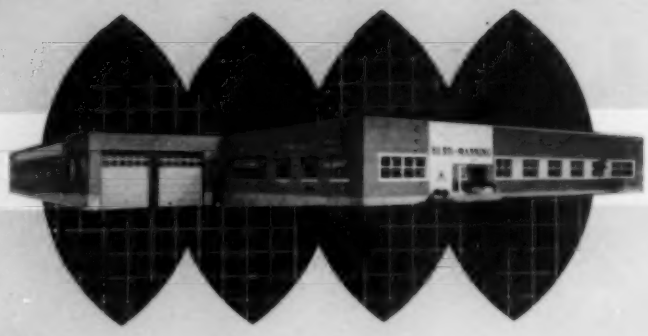

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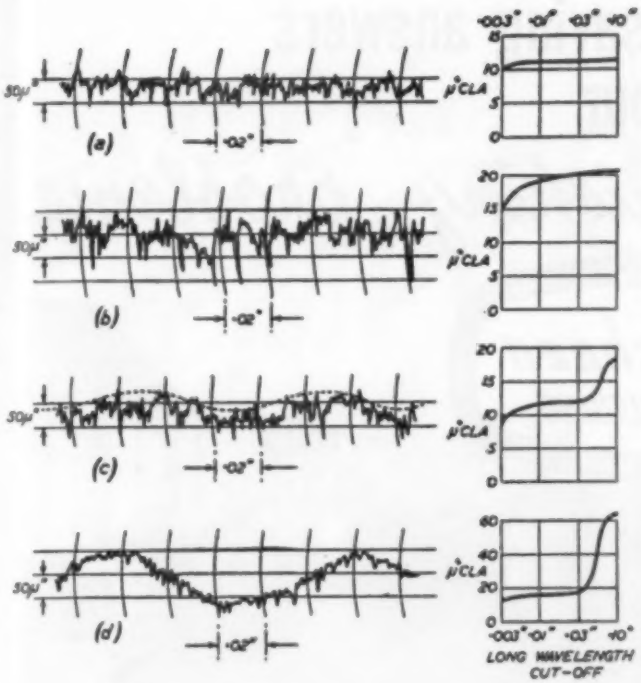

FIGURE 19

and manufacture. This is a notable achievement. The standards still differ a little in the terms used, though it is to be hoped that even these differences will eventually be overcome. Perhaps the most confusing difference lies in the use of the term 'sampling length', which in the earlier British Standard denotes the length of the individual sample on which the measurement is based, and in the American Standard the overall length of the succession of individual samples that are traversed in obtaining an instrumental reading. By contrast, the terms 'Centre Line Average' (CLA) and 'Arithmetic Average' (AA) are two different terms for exactly the same quantity.

The quantity measured—I will continue to call it CLA—is not a dimension in the ordinary sense (although it is computed from dimensions) and is best regarded as an **index** of surface finish useful for comparing one surface with another of the same kind. It is not even necessary to talk of microinches; indeed the Dutch (who have also adopted the CLA measure) have given the unit a non-dimensional name—the 'ru' (pronounced roo). Instead of speaking of a surface of x microinches CLA they speak simply of x ru, which is much simpler and just as useful for workshop purposes. I wish other countries would follow suit!

The CLA index is to be likened to a hardness number. Few people speaking of DPH or Rockwell numbers bother about how they are computed; they are just numbers, and one learns from experience what they mean in terms of performance. So with CLA index numbers. They give no direct information about the functional properties of surface, and their meaning must be learned from practical experience.

The last figure in this section (fig. 19) shows the effect of measuring the CLA value of some typical surfaces with different cut-off values. We measured the centre line average value of four different ground surfaces with an instrument having four different cut-off wave-lengths of .003", .01", .03" and .1" (the standard range) and to the right of each profile graph we plotted the readings obtained against the cut-off value. For the first surface, where all the crests lay fairly well along a straight line and where the crests were fairly close together, it hardly mattered whether we used a cut-off of .003" or .1"; we got just about the same reading of about 12 microinches CLA. For the next surface where the major crests were a bit further apart, we found that the .003" value did not transmit all the energy, and the reading rose from 15 microinches for .003" to 19 for .01"; but above that the cut-off had very little effect, and even for 0.1" the reading was only 21. In other words .01" cut-off was really sufficient for this surface.

In the third surface there was an embryo wave of about .1" pitch. When the cut-off was less than .1" it did not make very much difference what value was used, but when we opened up so as to pass this wave on to the average meter, then the reading rose appreciably.

Finally we had a surface with a huge wave in it; again we found that when the cut-off was less than the wavelength of the pronounced wave we got about the same reading—we were just measuring the scratch marks—but as soon as the wave was included the reading shot up.

I think that should give a fair indication of how important it is to be clear about what cut-off wavelength is being used by your instrument.

The most commonly used value today is .03". This is found to be sufficient for most ordinarily well finished ground, turned and honed surfaces; but for milled and shaped surfaces for which the traverse feed is often greater than .03", the measurement obtained will as often not be a full representation of the texture.

End of Part 2. The concluding part of this series is devoted to two important aspects of finish measurement. The theory and operation of the interference instrument is discussed at length, and the author concludes with some very practical on-the-job pointers on the use of instruments, reference standards—and common sense—in measuring surface finish.

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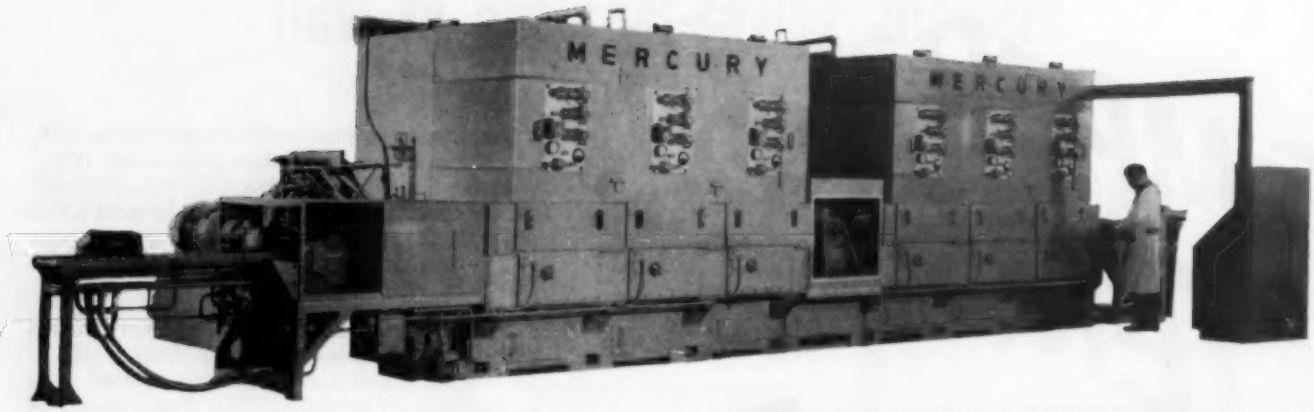


1. MERCURY ENGINEERING TRANSFER GRINDER for Ford Motor Co. will surface grind front and rear faces of torque converter housings. Machine has six 50-hp grinding grouped in two banks which are connected by a turnover station.

Transfer grinder permits fully

Automated Surface Grinding

on automotive converter housings

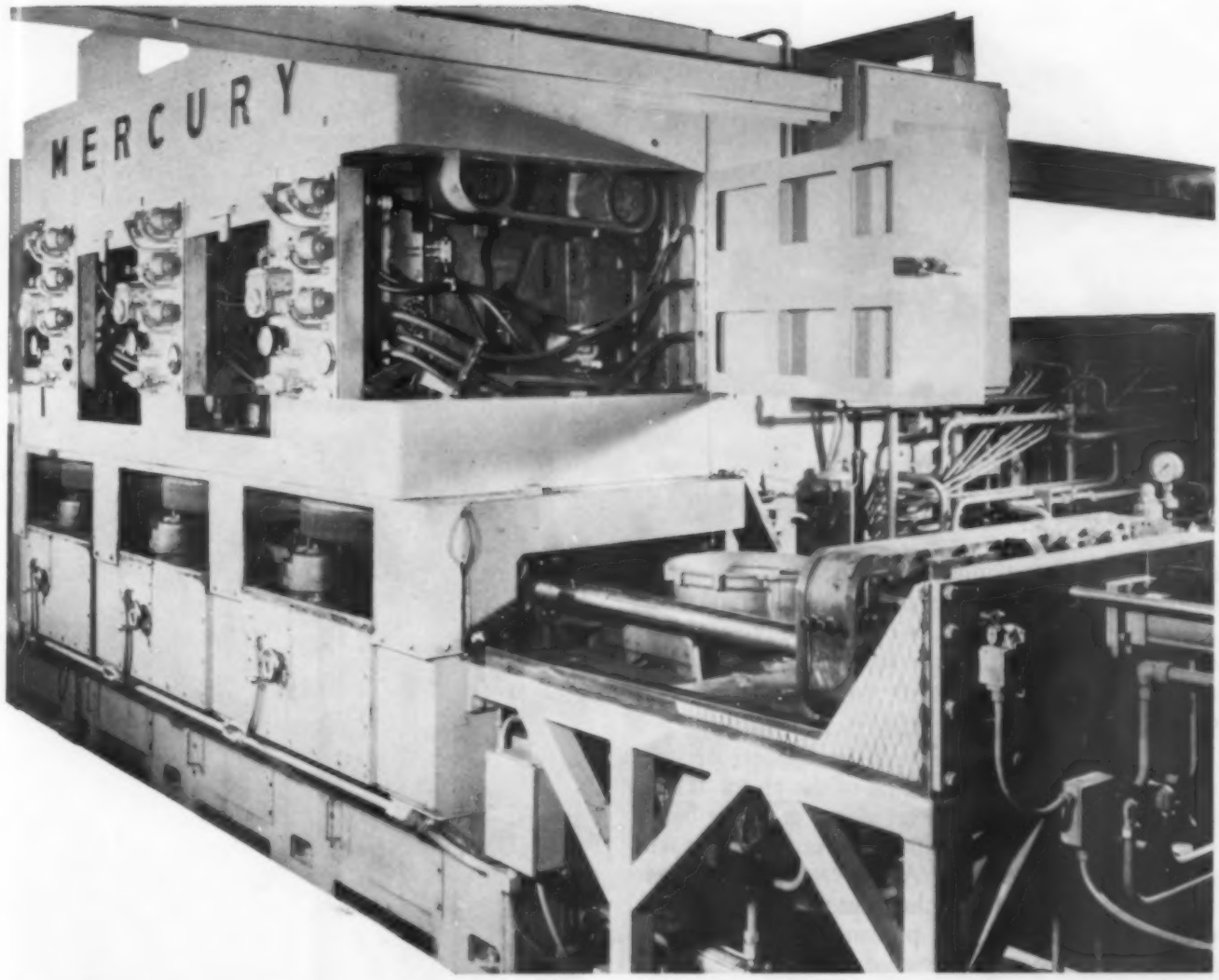
by **Jack Kenyon**
Managing Editor

Mercury Engineering of Milwaukee has just completed a six-spindle nine-station automatic transfer surface grinding machine for Ford Livonia which will rough, semi-finish and finish grind parallel faces of torque converter housings for 1957 Ford, Mercury and Lincoln automobiles. The transfer grinder, consisting of two three-station machines connected by a turnover station, chucks the cast iron housing successively in each of the six grinding stations and rotates it while the vertical grinding spindle is taking its cut. Between stations, parallel transfer bars with "flipper" part holders shuttle the castings through the machine in an automatic and interlocked cycle, the chucks being stopped in the same relative position at the completion of each grinding cycle to permit accurate transfer.

The operation to be done on the new Mercury grinder is complete machining of the front and rear faces of the housing, which was formerly accomplished in two steps as a turning operation on vertical turret lathes followed by surface grinding. Size control and flatness were problems with the thin-shell casting. The first three-spindle grinding bank removes an estimated .100-in of stock from the front or "open" face of the housing, the stock removal among the heads running in a 65-35-10 proportion. Following the turnover station, Bank "B" grinds the rear or "closed" face of the casting, using the previously ground face as a locator.

Automatic compensating size control for every grinding station is a feature of the machine in holding limits of .002-in. for parallelism and .005-in. on overall thickness. This is accomplished by Sheffield plunjet air gaging which obtains its reading off the back end of gaging rocker arms whose carbide-faced shoes ride on the workpiece throughout the grinding cycle. Included as a feature of the automatic size control system is an indicator dial at each station for use during setup; these dials are duplicated at the machine's main control panel for operator monitoring during regular operation.

The machine's six grinding heads are identical 50



2. ENTRANCE TO BANK "A" of Mercury transfer grinder with loading station at right. Loading station has orientation nest so transfer mechanism can accurately move part through sequence of rough, semi-finish and finish grinding on both sides of part. The machine accepts rough castings, finishes housings within .002-in. for parallelism, .005-in. overall thickness.

horsepower package-type units which feed down in the Mercury-designed parallelogram motion by gravity. Rate of feed and grinding pressure are regulated for each head by hydraulic control for maximum grinding efficiency, and at the bottom of wheel feed the travel is limited by a positive stop whose position is adjusted by a lead screw. A hydraulic "jumpout" unit quickly retracts the wheelhead at the completion of sparkout dwell.

The lead screw which positions the positive stop is controlled by a large hydraulic motor for setup purposes and for major movements during wheel changes. At other times, for small incremental changes in wheelhead travel limits, an electrically controlled hydraulic actuator called a "shot cylinder" does the repositioning of the stop. This would be true, for example, for wheel-wear compensation adjustments. All of these hydraulic units are of the package type and can be readily replaced individually for maintenance purposes. In fact, a whole head can be removed by quick disconnects if the need should arise, and be replaced as a unit.

For the grinding operations, wheel speeds are expected to be 5500 sfm. Wheels are 30 x 18 x 3 mounted on backing discs. Ford expects to use extra backing discs to keep wheel replacement down-time to a minimum. 30 gallons per minute of soluble coolant are fed into the water jacket of each grinding head and out by centrifugal force onto the wheel surface. Coolant for the Ford machine will be reclaimed by a central coolant system. Special coolant jets have been provided to keep the chucks clean.

The transfer cycle of the machine begins with the loading station, where the part is manually loaded, open face upward, onto a locating nest for preliminary positioning. This is necessary to orient the part before pickup by the transfer mechanism. From the locating nest the transfer bars engage the part by rotating "flipper" fingers into position under locating lugs on either side of the part, just under the

3. CONVERTER HOUSINGS TO BE GROUND by transfer grinder, above and right. First three heads grind open face of casting, last three grind closed face after turnover.

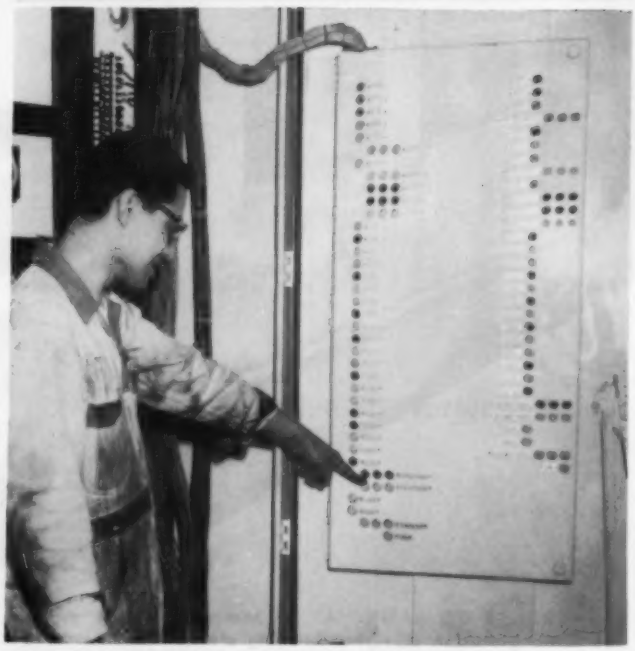
engine mounting flange. With the part supported by the flippers, the transfer bars travel forward with a 42-inch pitch to the first, or rough grinding, station of the first bank. Transfer bars ride on solid nylon rollers to prevent damage to bars or rollers from chips.

At the grinding station, transfer flippers deposit the casting on a center pedestal of the chuck. Then the three chuck support rings of the grinding bank rise simultaneously, and three rest buttons on each ring engage the casting. At the same time three latches, emerging from the center of the chuck, clamp the part by spring pressure. Clamping pressures are kept light to prevent distortion of the thin-walled part, but latches are locked to prevent movement or shifting of the casting. Part of the hold-down pressure is accomplished by the grinding head itself.

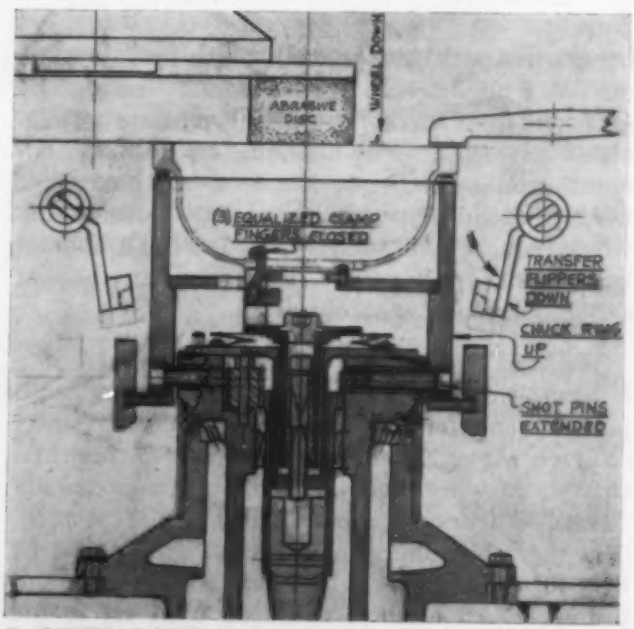
Chucks for bank "A" are all of the same design. Following rough grinding at grinding station one, the part is moved by the transfer bars and flippers through stations two and three for semi-finish and finish grinding of the open face, and then to the turnover station where it is rotated 180° to present the opposite face for grinding.

Chucks of stations four, five and six are somewhat simpler in operation than those of the first bank, and clamping and locating problems are reduced by having a ground face from which to work. In the second bank the flippers set the part on a ring of twelve locating pads, and two clamps hold it on the outside to complete chucking.

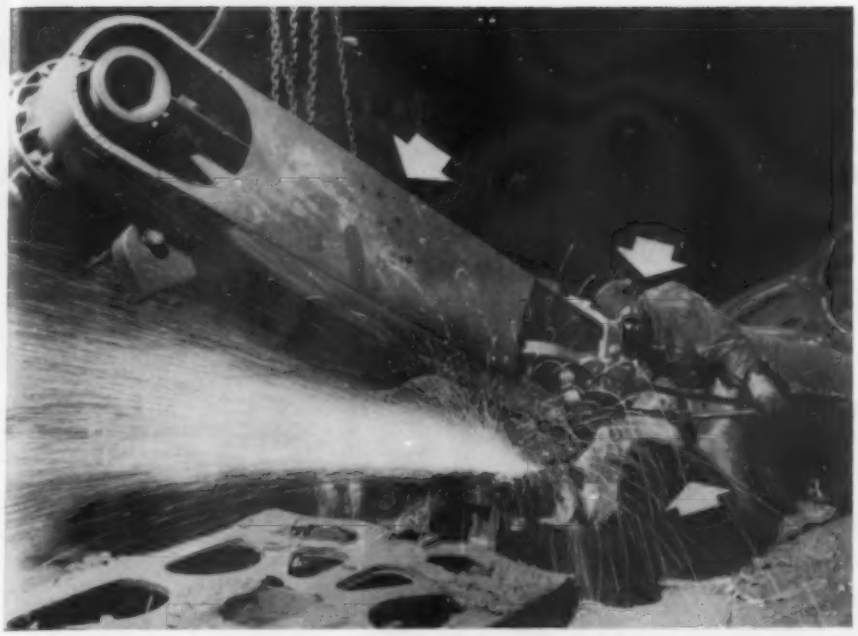
All hydraulic lines are manifolded to the outside of the machine for ready access by maintenance men, and as far as possible the entire run of the hydraulic lines has been kept on the machine's exterior. Another important maintenance help is a panel of circuit tracer lights next to the all-JIC electrical control panels which enable troubleshooters to locate circuit difficulties easily.



4. TRACER LIGHTS next to all-JIC electrical panels of transfer machine permit quick location of circuit difficulties.



5. SCHEMATIC OF BANK "A" CHUCK shows casting in grinding position, with fixture locked and rotating. Gage probe in upper right.



HEAVY DUTY SNAGGING on large steel casting is performed safely by this swing-frame grinder operator. Using proper goggles and wearing heavy protective clothing, he has his grinder hung properly so as to balance easily under his control, so that he can exert proper pressure to get out maximum production without causing undue wheel wear or wheel breakage.

GRINDING safely

by **Edmund Mottershead,** President
Mottershead Associates
Chicago

For best grinding results, and for best safety on the job too, use care, but don't be timid. We know enough to turn a wheel on and let it run a minute or so before starting a job, and also most of us have sense enough to stand to one side when the wheel starts up.

We also know enough not to crowd the wheel so that the rim heats up ahead of the rest of the wheel, weakening the wheel so that it will eventually crack and break.

However, we can be so cautious that work is spoiled and hazards result just the same. For example, take the case of a substitute man put to work on a 6″ x 18″ O.D. grinder operated by an older man in one shop. With a plunge cut grind, taking off a fair amount of stock but requiring a good finish, the new man started using the same wheel the older fellow had been using right along. However, he naturally dressed the wheel before starting his grinding. Almost at once he developed a bad case of chatter, and the wheel lost its cut, besides building up a lot of heat in the work.

He was so anxious to do a good job that he had dressed the wheel altogether too fine. Then, he was also too slow and cautious with the infeed. As a result, the wheel glazed up, causing chatter and heating the work. By redressing the wheel fairly coarse, he was able to rough grind with a fairly fast infeed. Then by letting the cut spark out in taking off the last few thousandths, he had no trouble with the finish. Yes, sir. There's a real difference between being careful and being too cautious.

THE "FEEL" OF THE JOB is just as important on this light burring operation as it is with the massive swing grinder shown above. Here the workman has good light to see what he is doing, a firm and balanced hold on the grinder, the work firmly held, proper eye shield to protect his eyes, and an accurate light touch as he applies the high speed point to the work.

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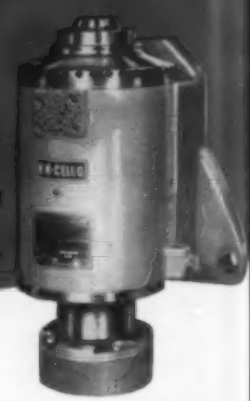

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In talking about a new abrasive, it is difficult to avoid the old cliches of "tougher," "cooler cutting," "longer lasting" and "faster cutting." And yet, these are the very properties which manufacturers want in the grinding wheels they buy. These are the same properties the abrasive maker is continually trying to improve.

After two years of field testing, a

Newer and Tougher Electric Furnace Abrasive

is now available offering longer life.

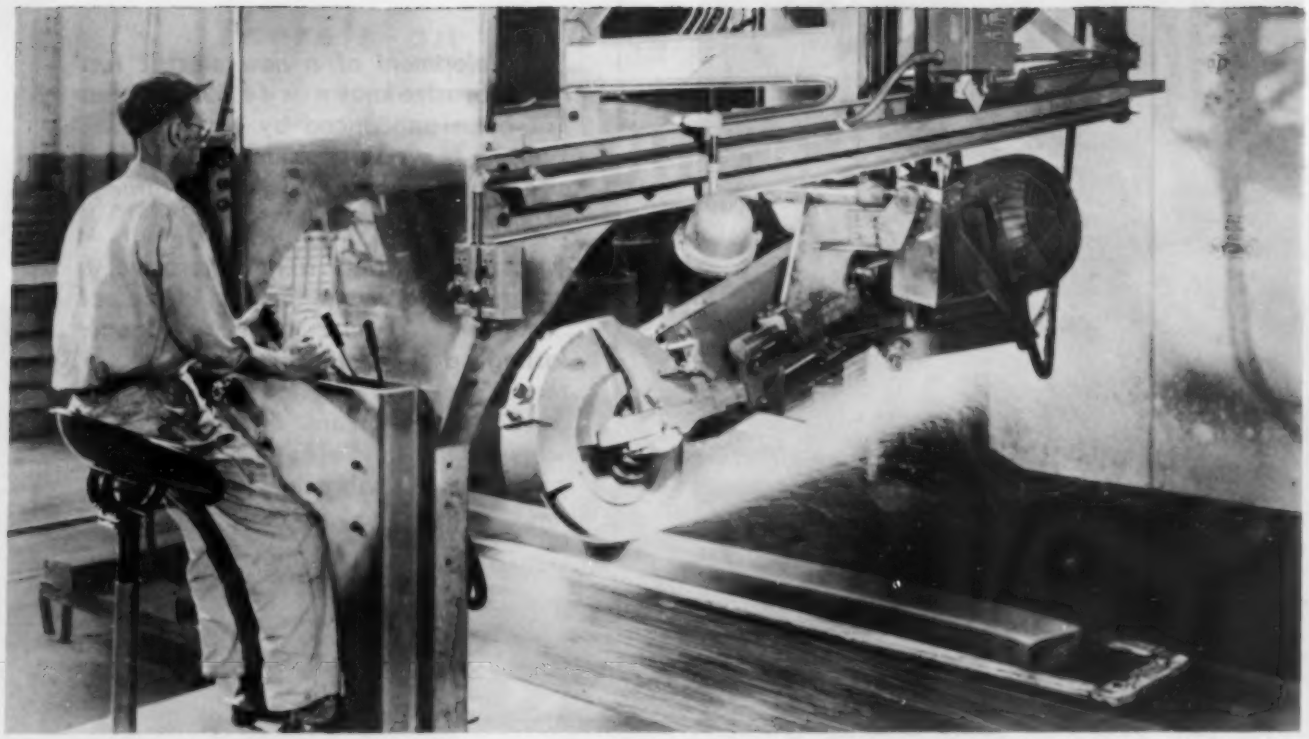
by **Robert G. Van Keuren**
Mgr. of Sales Engineering
Norton Company

● During the past two years, Norton has tested 44 Alundum abrasive wheels in over 1100 field tests at customer plants all over the country. In several areas of grinding, it proved to be substantially superior to other products available.

Greatest promise was shown in the rough grinding field on billet grinding and snagging steel castings. However, the properties which give longer life in rough grinding have also paid off in the precision grinding field. These wheels demonstrated a consistent tendency toward a greater number of work pieces between dressings, cooler cut and better finish.

Essentially, the new electric furnace process produces an abrasive which has less porosity than other types of aluminum oxide abrasive. While the new abrasive has the same chemical properties, its physical characteristics are different. The inherent strength of the less porous abrasive creates a tougher grain, which makes possible longer wheel life in severe grinding operations as in billet shops. Finer crystal structures also contribute to longer life, since grain fracture during grinding removes smaller particles of abrasive. The toughness of the new grain keeps it sharp longer on the wheel face.

To understand why these properties offer benefits to users of grinding wheels, let's review briefly the basic principles of grinding. Grinding is actually a cutting operation. Under a magnifying glass you can see the millions of tiny, sharp cutting points of the abrasive in the face of the wheel. As each cutting point passes over the work, it removes a metal chip as does the tooth or blade of a milling cutter. However, the similarity ends here. When a milling cutter becomes dull, it must be removed and resharpened. The grinding wheel is self-sharpening. When the abrasive points or edges become dull, the increased



NORTON'S NEW 44 ALUNDUM wheels have given substantially longer life on rough grinding operations. This trial of the new abrasive was made on a hydraulically operated swing frame grinder developed by Norton Company.

drag between the wheel and the work causes the grain particle to ultimately fracture. The dull point breaks away and a new sharp edge of the grain is exposed. Finally, the self-dressing action of the wheel is completed by the remainder of the grain being torn out under the impact of grinding, to expose new, sharp grains beneath. If the proper wheel is being used, the grain will fracture or pull out of the wheel face just when it becomes too dull to cut efficiently. If it stays in too long, spoiled work may result. If it breaks out too soon, uneconomical wheel wear results.

Two factors control the breaking away of dulled grain. One is the bonding material which holds the wheel together. The holding power of the bond is controlled in the manufacture of the wheel. It is referred to in the wheel specification as "grade". The other factor is the abrasive grain itself. It must fracture in such a fashion that new sharp points are being continually exposed. Each grain should fracture several times for the most economical grinding. The grain should hold a sharp point as long as possible, too. The new 44 Alundum, because it is tougher, holds its sharp point longer.

This ability to hold the point longer means that the user will grind more work pieces between dressings. He will find that in form grinding, the wheel will hold the shape imparted by the truing tool longer. In grinding sensitive work, the longer lasting sharp points will mean a cooler cut with decreased chance of burning the work.

Although these wheels are available in all sizes and types of wheels, their use is recommended particularly in certain fields. These include ball wheels, honing sticks, centerless, cylindrical and internal grinding, saw gumming, snagging, thread and disc grinding, and in mounted wheels in the harder grades.

Snagging

In terms of large volume grinding, the new wheels are expected to make the greatest impact in the snagging field. Wheels last longer under the heavy pressures of both hand operated and mechanically operated swing frame grinders. Users of portable and floor stand grinders have also reported very satisfactory results.

On floor stands, using 20 x 3 x 12", 44A16-QB11 wheels for snagging non-ferrous castings, one foundry reported that wheel life was improved 2 to 1 over its standard wheel. A southern manufacturer reported three times the wheel life with 44 Alundum abrasive. The field man, suspecting an error in the calculations, set up another test with careful control. The second test bore out the original findings. Claims that a new abrasive will double or triple wheel life in all cases would be sheer folly. However, results from hundreds of tests indicate that a substantial improvement in wheel life can be expected in most snagging operations.

Reports from plants testing 44 Alundum mounted wheels showed that 81% considered the new abrasive equal to, or better than, the wheels they had been using. (52% rated the wheels superior).

A Midwest foundry reported an increase of 30% in wheel life with faster cut when using 44A30-QB

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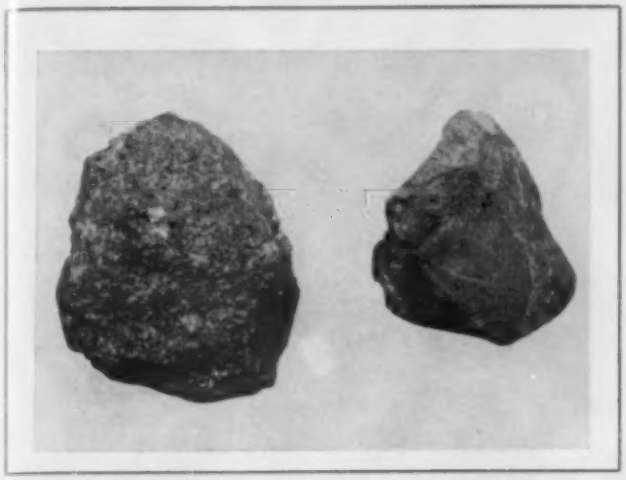

ALTHOUGH IT IS SIMILAR to regular Alundum in appearance and chemical properties, 44 Alundum (right) is less porous, hence a tougher abrasive. Its fracture characteristics produce sharper cutting grain than conventional abrasive.

mounted wheels in snagging steel castings.

Another Midwest plant found that shape A-11 mounted wheels in 44A36-RV gave four times the life of the previous best wheel with no sacrifice in cutting rate.

Saw Gumming

Tests in this classification proved the most outstanding of all. 75% of the plants testing the new wheels reported them "superior". A plant in Pennsylvania used an 8 x ⅛ x ¾", 44A46-MB11, wheel and reported it was the best they had ever used for saw gumming, giving much better life with no burning.

A plant in California found that for saw gumming, an 8 x ¼ x ¾", 44A100-WB11, wheel gave twice the life and showed better form holding ability than the wheels they had been using previously.

Precision Grinding

In the precision grinding fields, the improvements noted were better form holding and greater number of workpieces between dressings. Over half of the tests in cylindrical grinding applications showed the new abrasive superior.

A manufacturer in New Jersey, who grinds miscellaneous steel parts, reported that with a 30 x 5 x 12", 44A36-MVBE wheel he has averaged better economy as a result of getting more than 10% more pieces per dressing and 10% longer wheel life.

Using a 16 x 1½ x 8", 44A80-LVBE wheel, a plant in California reported that on plunge grinding steel shafts, Rc62, they were able to get 20 pieces per dressing compared with 15 using their standard wheel.

In the field of internal grinding, there have been a great many outstanding cases on difficult internal grinding jobs where production runs high and a non-premium priced abrasive is generally used.

For internal grinding small steel gears with 1 x 1 x 1¼" wheels in 44A60-NV, a plant in New Jersey reported 30% more pieces per dressing, 30% more pieces per wheel, finish improved from 28 to 15 rms, and the wheel excellent for grinding sharp radii.

Centerless grinding is another precision grinding field where trial reports indicate that these wheels produce more pieces between dressing. One manufacturer reported 1,000 pieces between dressings, where he had only been able to grind 600 before. In addition, he was able to perform the grinding operation in one pass instead of two. A Michigan job shop found the 44A801-NVBE wheel the most versatile they had used. On one job alone, they reduced the time from 14 to 10 hours for the same work.

Other Tests

After using an 18 x ⅜ x 9", 44A100-RB11 thread grinding wheel, one plant reported, "This is an excellent wheel; it held form better, required 50% less dressing, maintained better tolerance on root of thread, showed no sign of burn, and had faster cut."

A prominent ball manufacturer reported that he had repeatedly increased his overall performance by 46% as a result of using 44A462-Z2VBE wheels. He also reported that he is getting better duplication of performance from wheel to wheel than with any wheel he had used.

A third more life with faster and cooler cut was reported by a user of honing sticks made with the new abrasive.

Conclusions

At the completion of two years of field testing, results such as those mentioned, proved that 44 Alundum abrasive was ready to be placed on the market. Norton Company does not claim that this will be a cure-all for every grinding problem. When used in fields where this new non-premium priced abrasive has proved successful, the new wheels offer the user of grinding wheels a chance to try an abrasive which may cut his costs to a marked degree.

To help the ultimate consumer in selecting those jobs where 44 Alundum grinding wheels could be expected to perform most efficiently, Norton Company first had to thoroughly brief all its field men and distributors on the new abrasive. The company became an industrial pioneer in the use of Cinemascope photography to portray pictorially the uses and benefits to be derived from the new abrasive. Wide screen projection at briefing sessions throughout the United States and Canada provided a tremendously effective means of quickly acquainting these men with the facts they needed to know to prescribe the best use of 44 Alundum grinding wheels in plants wherever grinding is an important operation. • • •

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New process applies honing principles to finishing of hardened gear teeth to improve sound characteristics

Gear Honing

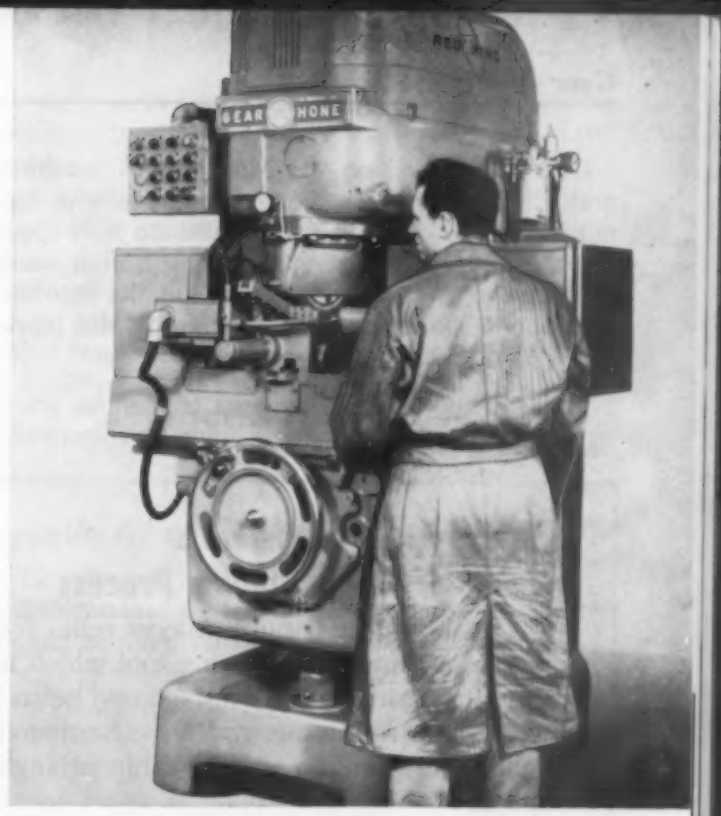
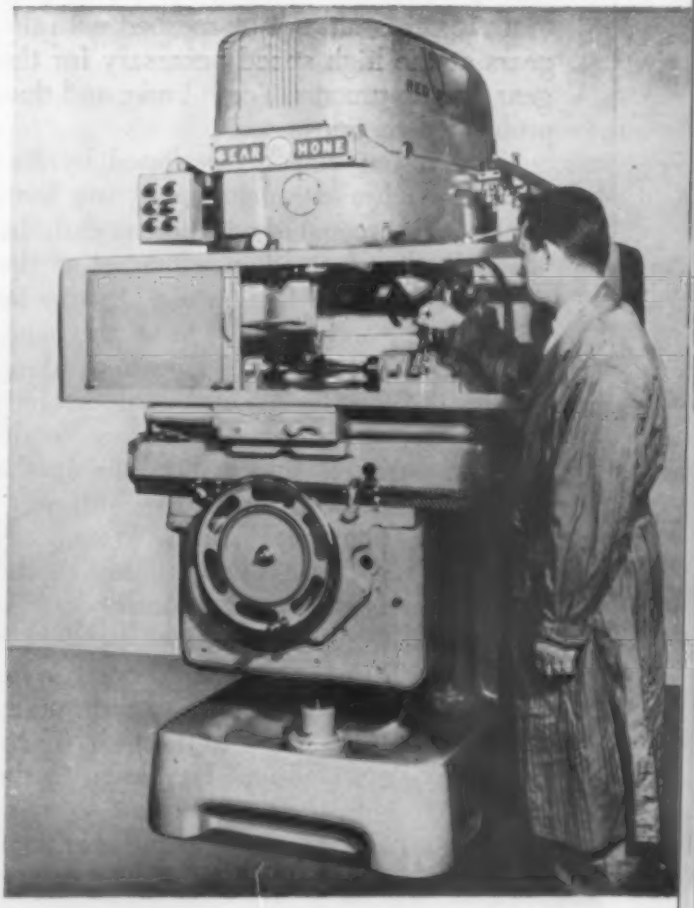


FIG. 1. EQUIPPED FOR FULLY automatic operation is this Model GHA gear honing machine. It is set up to hone a helical automotive automatic transmission pinion.

FIG. 2. SETUP FOR MANUAL loading of an automotive transmission helical gear is illustrated here on the new Model GHB gear hone.



● Detroit, Mich.:—Called Gear Honing, and developed by National Broach & Machine Co., Detroit, Mich., this new basic gear production process improves sound qualities of hardened spur or helical gear teeth by removing nicks and burrs; correcting small heat-treatment errors in spacing, profile lead or eccentricity; and improving surface finish. The new method can be economically adapted to both high and low gear production schedules.

To carry out the tooth honing process, National Broach engineers have developed two initial models of high speed Red Ring Gear Hone machine tools that operate in conjunction with a unique new gear tooth honing tool.

This honing tool is essentially an abrasive-impregnated helical gear that is run in mesh with the hardened gear in crossed axes relationship at high speed. The hardened work gear is driven by the honing tool and traversed back and forth across the honing tool in a path parallel to its axis during the honing operation. The work gear is run in both directions during the process. The process is readily adaptable to manual, semi- and fully-automatic loading arrangements. The honing tool is a throw-away type that is discarded at the end of its useful life. It is precision-manufactured and made to close tolerances.

Currently two initial models or Red Ring Gear Hones are available for production: Model GHA, figure 1, which is equipped with an automatic loader, and Model GHB, used when more tooth correction is desired, figure 2.

continued

Gears are honed on the Model GHA machine under low-backlash operating conditions with optional brake loading. This ultra-precision fully automatic machine has a specially designed, high-speed tool drive with head and tailstock spindles that can rotate up to 3000 rpm and more, figure 3. Mist lubrication is used.

Model GHB is ideally adapted to manual, semi-automatic or fully-automatic loading arrangements. When arranged for manual or semi-automatic loading, gears up to 8-in. pitch diameter can be honed on the machine. Gears up to 3-in. pitch diameter can be honed when the machine is equipped for fully automatic loading. Crown honing operations can also be performed.

A unique feature of Model GHB is a patented zero backlash, self-adjusting table arrangement, figure 4. The headstock and air-powered tailstock

New Type of Wheel Is Heart of Gear Honing Process

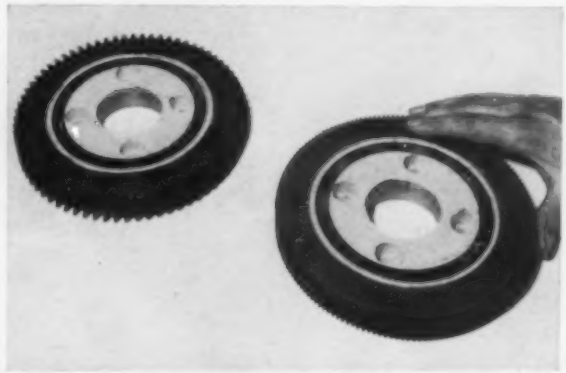
The new gear honing process relies for its effectiveness on a honing tool which is essentially an abrasive-impregnated helical gear that is run in mesh with the hardened gear in crossed axes relationship at high speed.

Before the present honing tool (let's call it a wheel for purposes of present discussion) was developed a number of alternate methods had been tried with no success. A standard abrasive wheel, for instance, couldn't be used. While the abrasive wheels could be formed with teeth these tooth forms could not be meshed with the gears at the high speed necessary for the gear honing process. Teeth broke and thus prohibited their use.

The present wheel, developed by National Broach and Machine Co., is a form of plastic impregnated with silicon carbide. The wheel is formed in a master of the same shape as the final wheel. It may be assumed the master mold is of the same material as the wheel. Somewhere along the line the wheel is "cooked". Understandably, National Broach is reluctant to divulge too much information about the wheel's manufacture at the present time.

The wheels are within tenths in accuracy of the master. There is no limitation on the size of wheels which can be formed.

The wheel appears to clean itself as it meshes with the gears being honed; wear is even. It generates itself and continually presents the same form to the gear. Theoretically, the wheel will last down to the smallest practical stub without care or dressing whatsoever. No studies have been made regarding wheel life. Should the wheel load, on heavy stock removal operations performed on an experimental basis, sand blasting is used for cleaning operations. There is no wheel loading when honing carburized gears; no studies have been made, up to this writing, on cast gears.



TWO RED RING GEAR honing tools. The amount of helix angle on the teeth of the abrasive-impregnated tools depends upon the helix angle of the work gear and the amount of crossed axes angular setting.

Inasmuch as the honing of gears is to remove nicks and burrs in an effort to improve sound qualities the amount of metal removed is no major problem or concern. On test runs, however, .003-in. of metal was removed at one time on 100 gears and no detrimental wear effect on the wheel was observed.

Wheels are furnished in varying grits; a 10 micro finish is obtainable with an 80 grit wheel. Finish naturally varies with the grit of the wheel.

At the present time, officials of National Broach say there is no thought of entering the wheel manufacturing field with standard wheels or hones for finishing operations. The wheel will be used only in conjunction with their new gear honing machine.

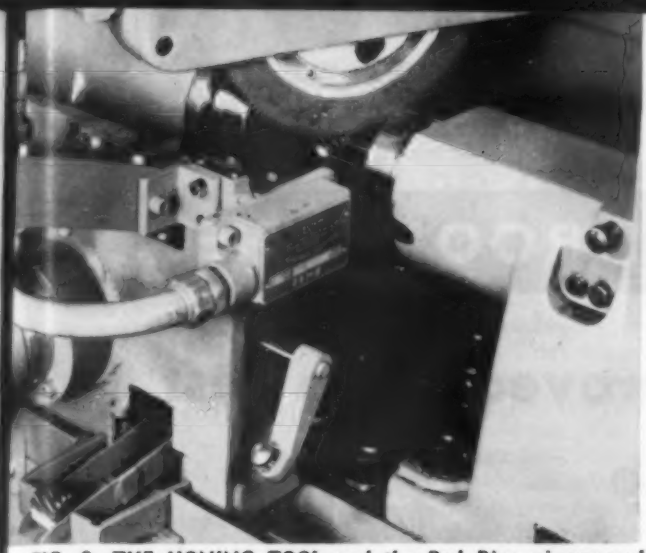


FIG. 3. THE HONING TOOL and the Red Ring air-powered rocker-type automatic loader is shown in this closeup view of the Model GHA gear hone. A finish-honed pinion is in the unloading chute at the lower left.

are mounted on a tilting table that is attached to the reciprocating work table through a hinged mechanism at the rear. Thus, the head and tailstock can be lowered either manually or automatically for loading the gear into mesh with the honing tool. After loading, the table is tilted upward into zero backlash position and locked, where it remains throughout the gear tooth honing operation during which the work is revolved in both directions. If desired, the tilting table action can be locked out to permit honing under low-backlash conditions with brake loading.

The Gear Tooth Honing Operation

The honing action of the abrasive-impregnated gear tooth honing tool removes all nicks and burrs in the tooth flanks. The honing process is designed to remove metal up to 0.002-in. over pins. However, since the honing action tends to accurately generate a tooth form and shape, small corrections in tooth form and lead which will considerably improve the sound characteristics of a hardened gear are made by the process. Surface finishes of fine quality can be readily achieved with the honing process on shaved gears.

A honing cycle of less than one minute will remove nicks, smooth the surface and make sufficient tooth form and lead correction to provide gears of uniform, low sound level. A lubricating-type coolant whose main requirement is the flushing of removed metal from the mesh is used.

Small pinions are rotated at speeds up to 3000 rpm for the honing process. Larger gears are honed at speeds corresponding to about 800 surface feet per minute.

Applying the Gear Tooth Honing Process

Gear honing is a hard gear finishing process. Present methods of generating gear teeth in the soft state should be used. This means hobbing or shaping followed by shaving. Thus maximum uniformity is assured in all soft gears, as well as having suitable form and lead correction allowances made in the teeth before they are heat-treated. This method leaves only the correction of minor form and lead errors up to the honing operation, as well as the removal of any nicks or burrs. By making the most accurate gear teeth possible in the soft state, maximum honing tool life is assured and minimum cost and honing time will result.

Following the heat treatment process, the hardened gears should have their locating holes and/or faces ground in accordance with the usual practice. Then all gears are put through the honing process to remove nicks and improve sound quality. If sufficient control is exerted in the hobbing, shaving and heat treatment process, it is possible to eliminate entirely the conventional hard gear nick testing operation where nicks and burrs are located for subsequent removal by a pencil grinder. • • •

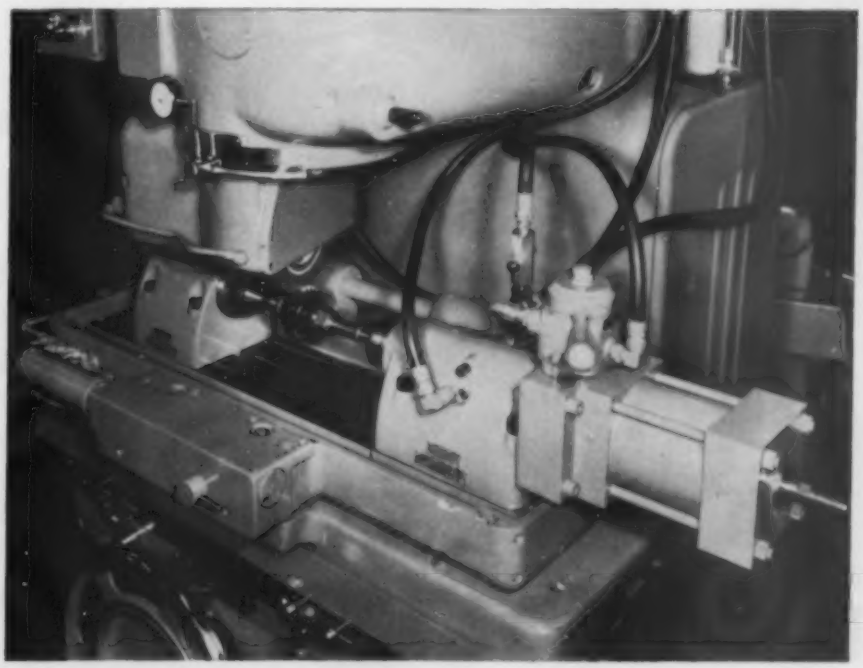
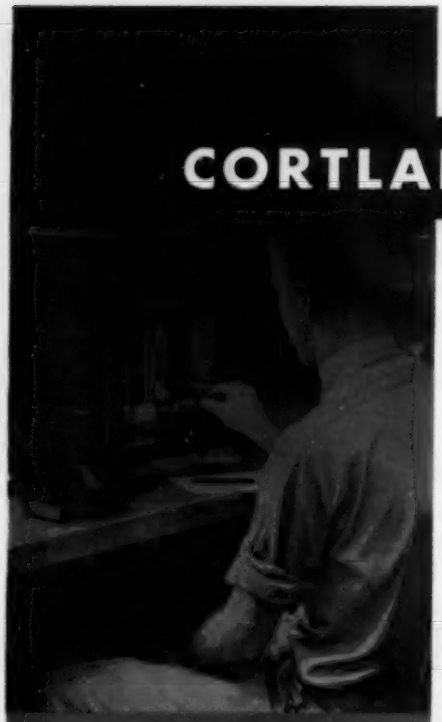


FIG. 4. CLOSEUP VIEW OF the Model GHB. Tailstock operation is controlled by the manual air valve on top of the tailstock air cylinder at the right. Tilting of the work table for loading and unloading is controlled by the manual air valve control under the air cylinder on the left side of the table. The hinge mounting for the tilting table is visible at the rear of the work gear and honing tool.



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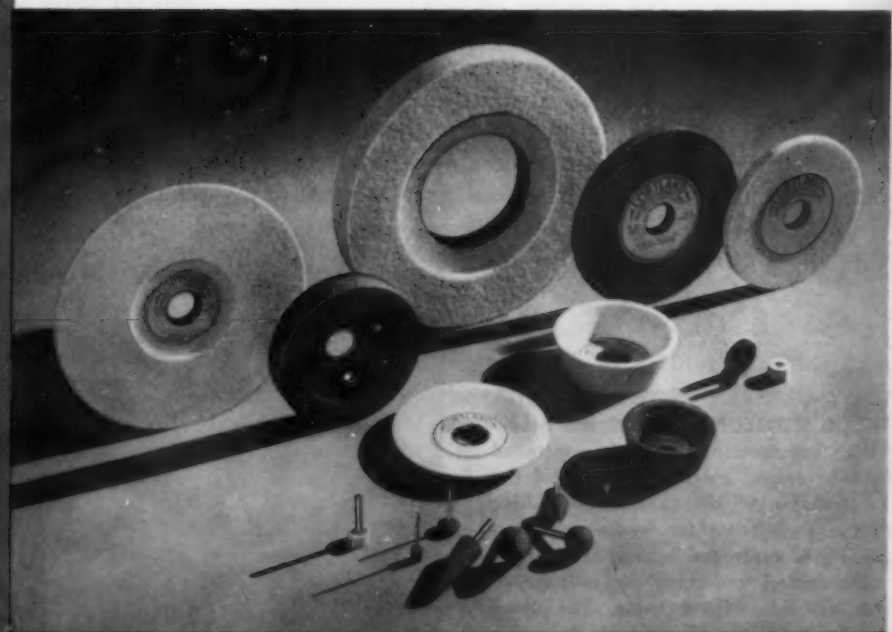

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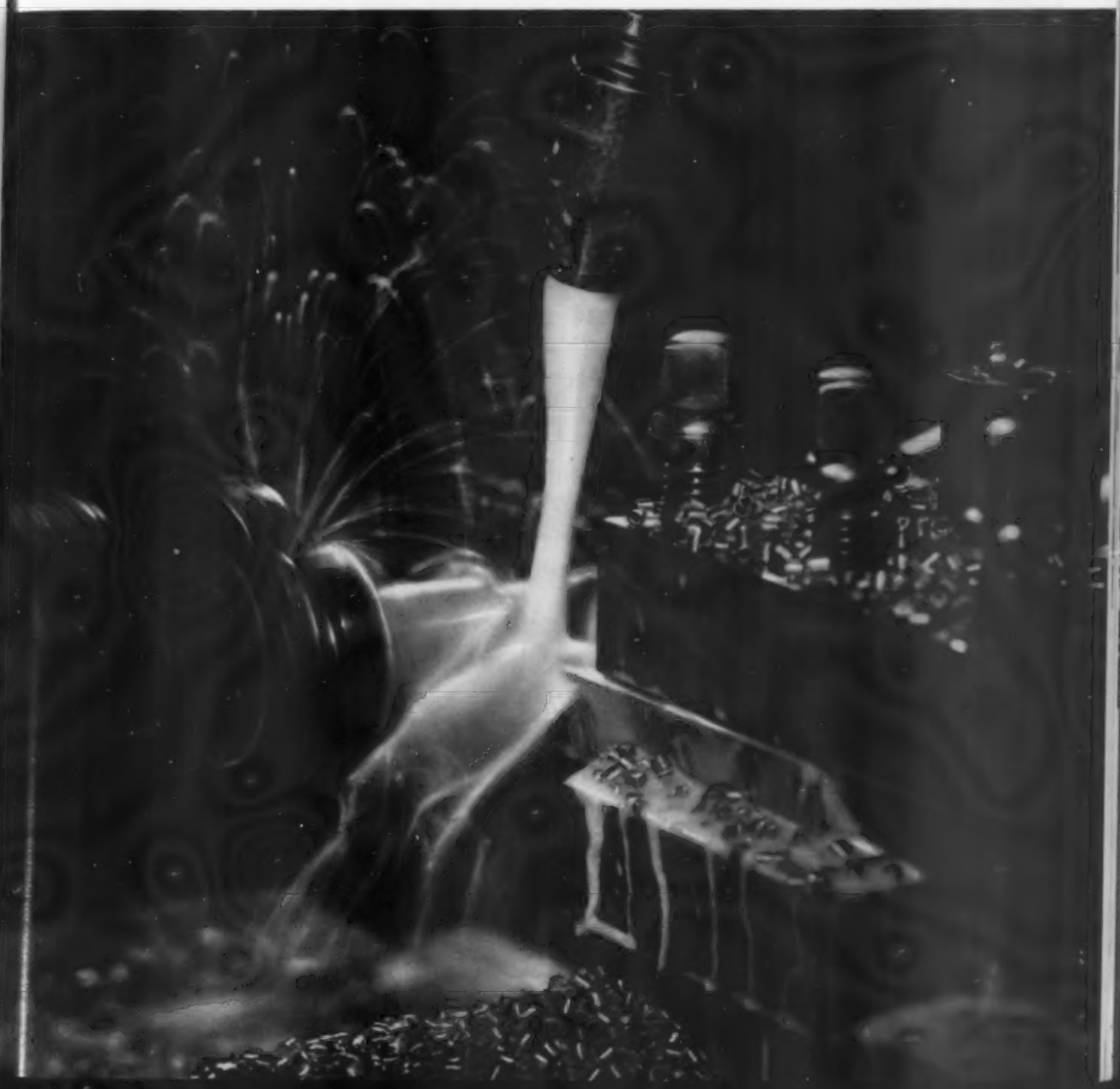

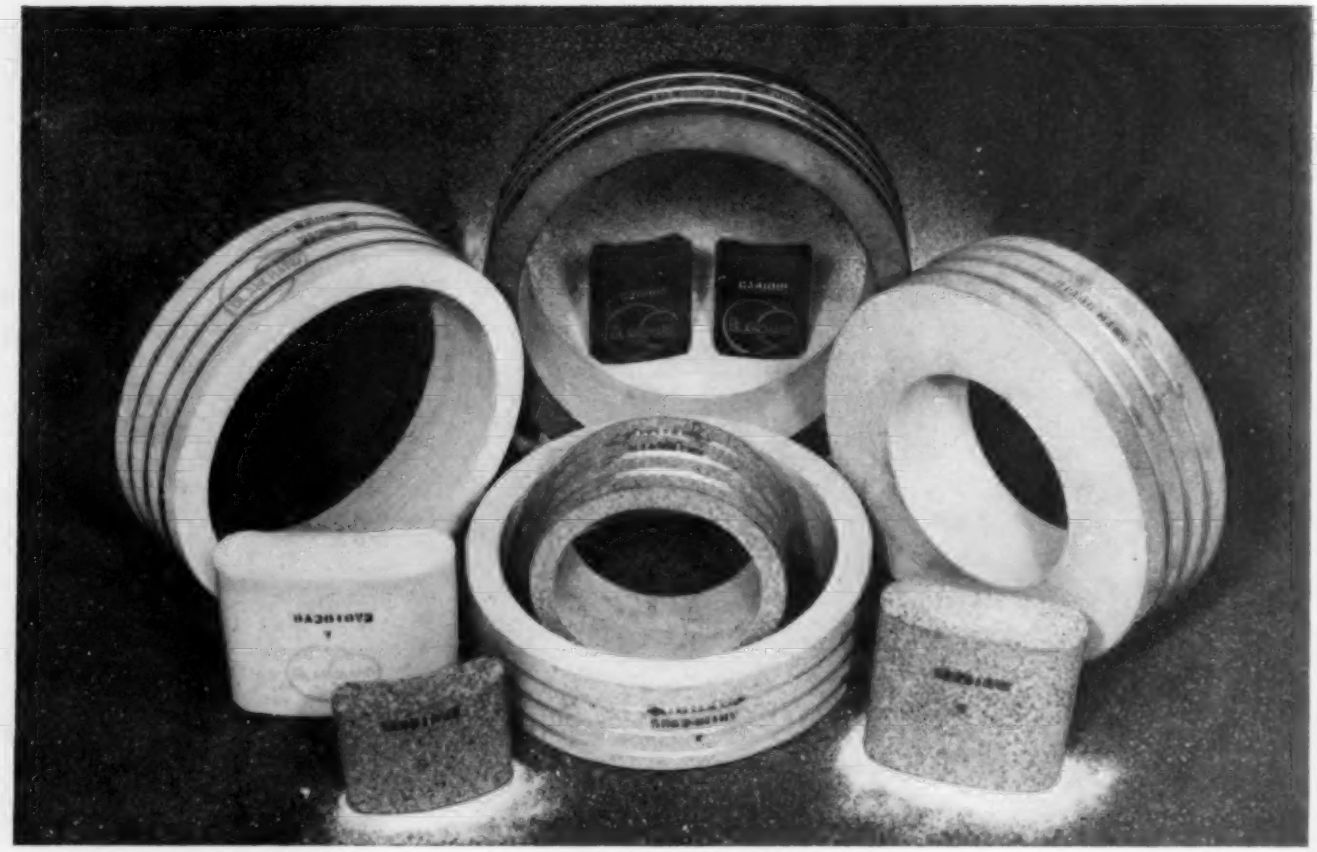

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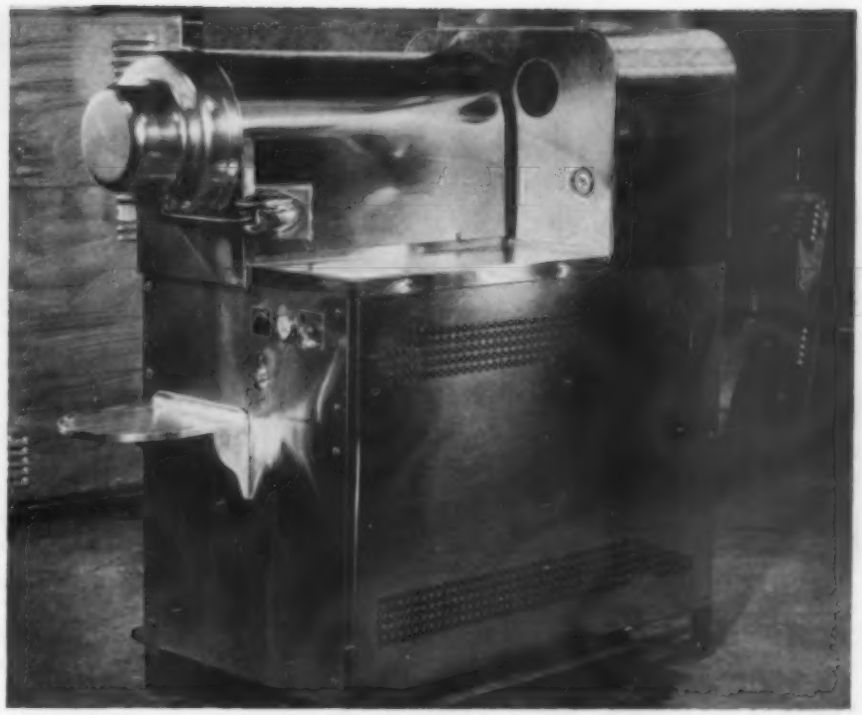


THIS IS THE SOFT ice cream machine on which the small "PG" wheel is used in polishing the ID of the evaporator. Picture shows the machine with sanitary cover over evaporator (upper left portion of machine).

by **G. G. Willson**
Manager, Technical Service
Coated Abrasives Div.
Minnesota Mining & Mfg. Co.

Small Coated Abrasive Wheel

Polishes Inside Diameters

. . . at ¼ of the Former Cost.

An Indiana manufacturer was looking for a faster method of polishing the inside diameters of ice cream machine evaporators. He found it—and by changing methods he has so far cut abrasive costs from $1.80 to $.035 a unit, and the price is still going down!

In addition, overall savings on the unit including labor, materials and elimination of rejects, amount to 75%.

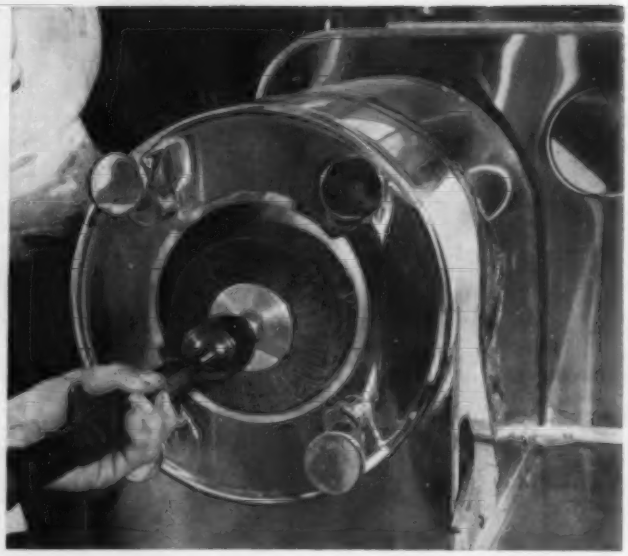
● General Equipment Company is acutely aware of the importance of fine finishes in the manufacture of its soft ice cream machines, known to the industry as "Sani-Serv" units; its malted milk and milk shake machines known as "Sani-Shake" units; and its line of coolers and cabinets under the "Gemco" label.

Laws governing the inspection of food equipment vary from place to place. The most rigid of these inspections must be used as a standard, which will be accepted everywhere—and which is subsequently far above the requirements of many states and cities.

The evaporator on the "Sani-Serv" unit was causing a production finishing problem. It was simply this: to produce a standard finish on the ID of a 7" x 24" or 7" x 30" evaporator, a finisher was spending up to 16 hours, or two full working days. This particular method produced the desired finish, but along with it went high labor costs and rapid consumption of finishing materials.

Although the ID of the evaporator has a certain

A CLOSEUP OF THE evaporator after the dasher's "dry run" shows the type of scratches which must be removed by the "PG" wheel operation. Finishing time has been slashed by 75%.

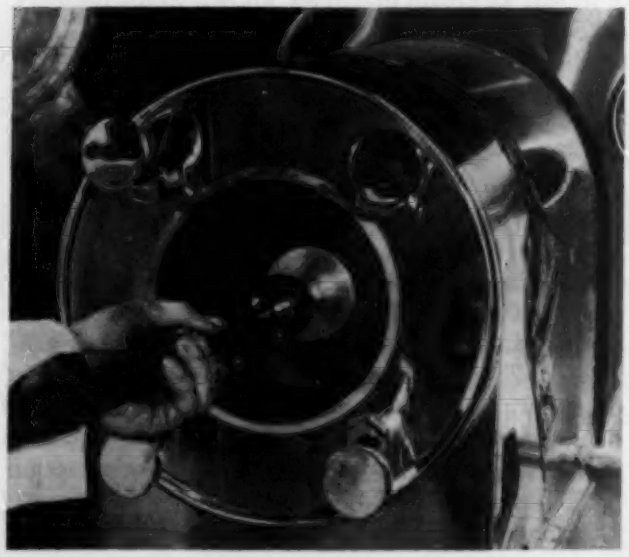


A STILL SHOT OF THE polishing and grinding wheel shows its many coated abrasive sections, and the flanges which securely lock them in place. As the wheel wears it retains its shape; always presents fresh mineral to the work.

degree of smoothness when it approaches the finishing line, the dasher (which churns the ice cream mix in the evaporator) is slipped into the unpolished evaporator and run dry for several minutes to "seat" it. Then the dashers are polished, and the evaporator moves to the finishing line with slight scratches produced by the dasher's test run.

The previous finishing method employed a 3½" pneumatic drum on a flexible shaft machine. Abrasive sleeves 3½" x 15½" were used in a grit sequence of 40, 60, 80, 120 and 320, and a buffing was often necessary to produce the final finish. Even finishes for machines going to states with a less stringent sanitary code than Florida required eight hours finishing time.

A 6" COATED ABRASIVES wheel fits comfortably into the 7" diameter of the evaporator on the "Sani-Serv" unit. As the operator applies pressure the wheel removes scratches left by the dasher; as pressure is lessened, wheel polishes ID.



Gemco's customers do not buy on price alone, and its standards are necessarily high. Costs and methods are carefully studied. Even if a given method appears to save time and money, it is not adopted until company management is certain it will upgrade the quality of their products.

So the firm tested methods for finishing the evaporators' ID's and ultimately selected a small coated abrasive polishing and grinding wheel developed by Minnesota Mining and Mfg. Co. of St. Paul, Minn. Although the wheel is available in many sizes and a wide range of grits, Gemco methods engineers found that a 2"-wide by 6"-diameter "PG" wheel, grit 150, produces the most satisfactory results. Once the size was determined the construction selected was aluminium oxide mineral with a resin-over-glue bond on a cloth backing.

The polishing and grinding wheel is composed of hundreds of die-cut coated abrasive sections, firmly bonded into a wheel with resins and reinforced with flanges. The nature of the wheel is such that the abrasive grain and the backing wear away together; thus, fresh abrasive is continuously being presented to the work. As the wheel wears away, its rate of cut and the micro-inch finish it produces remain constant.

Using the grit 150 "PG" wheel, Gemco finishers found that by bearing down slightly the wheel would remove all rough spots and imperfections previously removed with grits 40 and 60 abrasive sleeves—and that by using less pressure the same wheel would produce a finish superior to a grit 320 sleeve—without subsequent buffing.

Total finishing time has been slashed to two hours—⅛ of the time it previously took to produce

THE COATED ABRASIVES wheel in action. Scratch pattern developed by using pressure is blended as pressure is decreased.

a standard finish and ¼ of the time it formerly took to produce most other finishes.

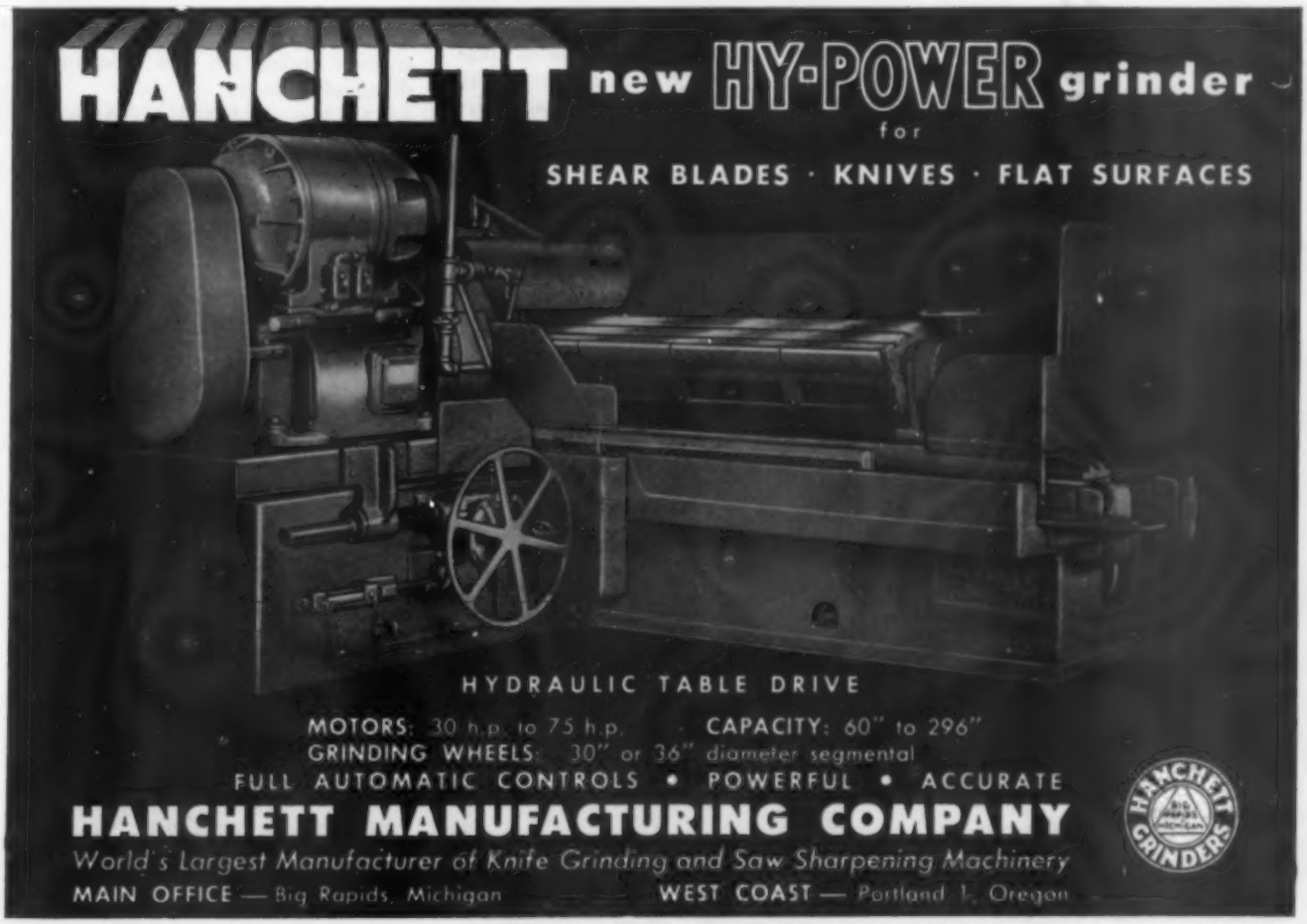
"Our method of pre-fitting the dasher assures us of a perfect fit in the finished machine," according to L. D. Forthoffer, general manager of the manufacturing company. "The coated abrasive wheel does a beautiful job of removing dasher marks and generating a high finish, without removing so much stock as to throw the dasher out of line in the finished machine. We market the 'Sani-Serv' machine nationally, and we've never had a complaint about the finishes we're producing with the 'PG' wheel."

Gemco methods men had another idea: that when the 6" polishing and grinding wheel wore down sufficiently it would be used to polish the ID of 5" evaporators on another model of the firm's ice cream machines. This idea hasn't had a chance to be tested so far—because after polishing 200 evaporators (7" size), for a total of more than 400 hours use, the wheel's diameter has been reduced by less than ¼".

The new method is resulting in valuable cost-reductions within the Gemco plant. Rejects have been eliminated; there is negligible downtime for changing wheels (previously, abrasive sleeves were changed each time a new grit was used) and abrasive cost on each evaporator has been reduced from about $1.80 to approximately 3½ cents, according to Forthoffer.

In terms of overall savings—including labor time, materials, inspections, and the like—finishing cost has been slashed by 75%.

Time savings haven't imposed any hardships on Gemco employees; no one has lost a job. Instead, production of soft ice cream units has been increased. Where it used to take almost two days to finish an evaporator—up to four of them can now be finished in a single day. • • •


HANCHETT new HY-POWER grinder
for
SHEAR BLADES · KNIVES · FLAT SURFACES
HYDRAULIC TABLE DRIVE
MOTORS: 30 h.p. to 75 h.p. CAPACITY: 60" to 296"
GRINDING WHEELS: 30" or 36" diameter segmental
FULL AUTOMATIC CONTROLS • POWERFUL • ACCURATE
HANCHETT MANUFACTURING COMPANY
World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery
MAIN OFFICE — Big Rapids, Michigan
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HANCHETT GRINDERS

Shop Hints and Short Cuts

Coolant Deflector for Truing Diamond

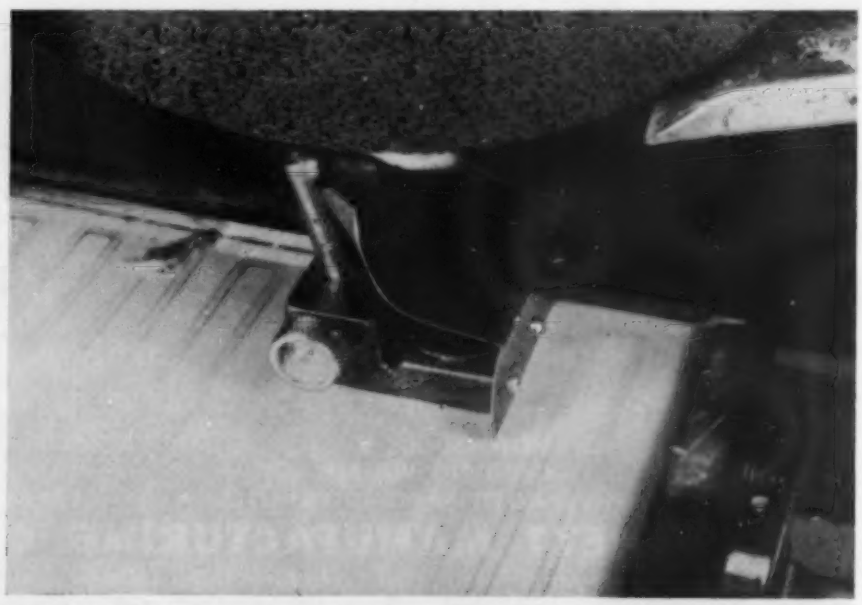
by **H. J. Gerber**

It is a generally accepted fact that a wheel truing diamond should be kept flooded with coolant while it is in contact with the grinding wheel. It is also true that an intermittent flow of coolant may be worse than no coolant at all as it may suddenly cool an overheated diamond and cause it to crack.

On some of our surface grinders it is difficult, with the standard coolant nozzle, to maintain a flood of coolant on the diamond at all times. In an attempt to rectify this deficiency we made up a simple deflector shield and fastened it to the diamond support block.

As will be seen from the photograph, the coolant stream is now deflected upward and directly on and around the diamond point. This has resulted in a superior truing job and reduction in diamond damage.

This deflector was made from a piece of scrap stainless steel sheet stock and secured to the block by two small machine screws. It will be noted that the sides of the deflector are bent inward to form a trough which further assists



Coolant deflector fastened to truing diamond support. Sides are bent to form a trough.

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Sunnen field representatives are far more than salesmen. They are factory trained engineers who have specialized knowledge of everything connected with producing accurate holes.

They carry a demonstrator honing machine . . . and can work out most any hole problem you may have. In addition, Sunnen Laboratory service is available to help handle unusually complex jobs.

See for yourself how Sunnen Honing can cut your hole production costs, and eliminate production bottlenecks—right in your plant.

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5
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W&B LUBRICANTS AND COOLANTS IMPROVE EVERY GRINDING JOB!

Sixty-seven solid years of *specialized experience* stand behind White & Bagley Grinding Lubricants and Coolants. Here are some of the W & B products that are *boosting production, reducing grinding costs,* and *producing better finishes* for more and more plants throughout the world:

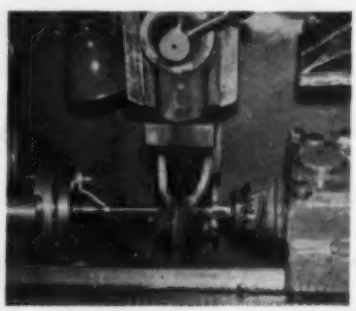
W & B Lubricant 1888 insures rapid and clean stock removal; keeps wheels open and free-cutting; permits the use of finer wheels to produce smooth finishes.

W & B Grinding Concentrate 1500 transparent and foamless; gives unusually keen grinding action and rapid chip settling; for grinding ferrous metals.

Courtesy, Norton Company

W & B Grinding Lubricant E-1 produces the highest reflective finish; permits rough grinding and finishing with the same wheel.

W & B Grinding Oil 1572 for close-tolerance, critical oil grinding; especially desirable on machines which perform a wide range of oil-grinding operations.



Courtesy, Jones & Lamson

W & B Base L adds potency (sulphur and fat) to petroleum or cutting oils to give improved results in grinding and machining.

Let us help you with *your* needs for grinding lubricants and coolants. We specialize in *your* requirements. For further information, mail the coupon today!

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Originators of Grinding Lubricants

W+B INDUSTRIAL LUBRICANTS

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Circle No. 220 on postpaid card

Coolant deflector in use. Note complete envelopment of truing diamond with coolant.

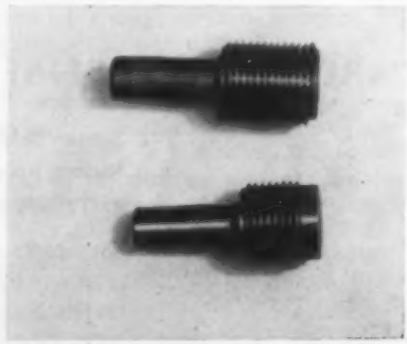
in concentrating the flow of coolant onto the diamond. •

Salvaging Thread Plug Gages

by **H. J. Gerber**

I have found that the simplest method for extending the life of a "no-go" thread plug gage is to mount it between centers on the cylindrical grinder and remove the first two or three threads down to the root diameter. This method is effective because usually only these first few threads are used when using this type of gage and the remaining threads are like new. This process may be repeated several times, each time grinding the threads farther back.

To some extent this method is also effective on "go" gages as they also are often used only on the first three or four threads. A pitch diameter test will indicate whether or not the "go" gage has enough unworn threads to warrant the use of this method. •



Thread plug gage on bottom has been ground to remove the three worn lead threads. Practice is most effective on "no-go" gages.

Scotch Tape Protects Wheel Markings

by **H. Landauer**

We learned the hard way that nothing can be more irritating than a stock of used grinding wheels with grade markings faded beyond recognition.

On all our present wheels as well as on any new ones being purchased, we cover the markings on both sides with transparent (Scotch type) tape, to protect the vital markings. So far results are good, and we expect to be able to read the specifications throughout the entire wheel life. •

Available Literature

Free Catalogs and Bulletins

To receive your copy of any of the literature listed here use the post-paid card inside the back cover. Just circle the identifying number on the card and mail it. We'll do the rest.

Wall Charts

Two giant-sized wall charts are available free of charge for use in your shop's training program. One names the parts of a plain cylindrical grinder; the other illustrates methods of grinding cylindrical parts. Both are clearly legible at a distance.

Landis Tool Co., Waynesboro, Pa.

Use HANDY Postpaid Card. Circle No. 1

Grinding Handbook

"A Handbook on Tool Room Grinding" is a 222-page book (Form 781) which combines under one cover the information previously found in three booklets covering general tool grinding, carbide tools and cast alloy tools. One of the most complete and up-to-date reference books for tool room use.

Norton Company, Worcester 6, Mass.

Use HANDY Postpaid Card. Circle No. 2

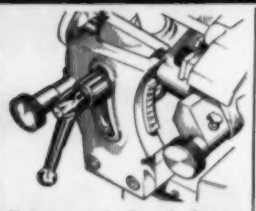
Ultrascopic Vision

Metal- and plastic-framed safety glasses feature a new "ultrascopic" lens shape which provides extra coverage at outer circumference where protection is vital. Greater visual area and more appealing shape are also claimed. With or without side shields; clear or Calobar (glare-proof) lenses.

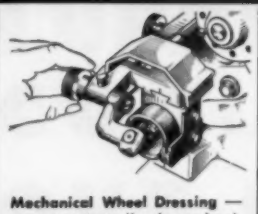
Illustrated booklet available from American Optical Safety Products Div., Southbridge, Mass.

Use HANDY Postpaid Card. Circle No. 3

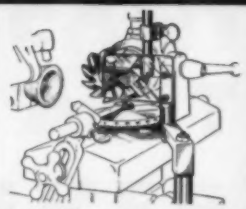
WALL CHARTS (see No. 1)



Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.



Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.



Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

Here is a completely NEW method for grinding helical cutters...

It's name is

END MILL
CENTRA·POINT
GRINDER ®

It can save you time in sharpening

END MILLS
PLAIN MILLING CUTTERS
SHELL END MILLS
STAGGERED TOOTH CUTTERS
CHUCKING REAMERS
COUNTERBORES, ETC.

CENTRA-POINT'S new ball bearing carriage and workhead allow sensitive movement necessary for following helixes of small milling cutters.

Free folder tells the whole story

CENTRA-POINT DIVISION
William H. Field Co., Inc., 331 Dorchester Ave., Boston 27, Mass.

Please send the complete CENTRA-POINT story, at no obligation.

Name _____ *Title* _____
(Please print)
Company _____
Address _____
City _____ *Zone* _____ *State* _____

Circle No. 221 on postpaid card

Measuring Surface Roughness

A colorful booklet presents the Profilometer Type QA Amplimeter, which shows rms or arithmetical average roughness height in microinches. Unit is portable, plugs into a 115-volt a.c. outlet. Selector switch provides choice of six measurement ranges: zero to 3, 10, 30, 100, 300, or 1000 microinches.

Micrometrical Mfg. Co., Ann Arbor, Mich.

Use HANDY Postpaid Card. Circle No. 4

Grinding and Polishing Appliances

This 10-page booklet illustrates how several leading appliance manufacturers are using 3M coated abrasives in various forms. It makes case history presentations of several abrasive operations, including prefinishing, weld grinding and blending, removing imperfections, and finishing and polishing. Belts, sheets, discs and wheels are shown in use.

Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

Use HANDY Postpaid Card. Circle No. 5

Gaging Systems

"Automation Gaging Systems and Standardized Control Units" explains the four gaging systems used for automatic control: electric, air-electric, electronic, and air-electronic. Catalog describes the components that make up each system.

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

Use HANDY Postpaid Card. Circle No. 6

Good Shopkeeping

In light cartoon style, this booklet outlines a program that is claimed to result in healthier, cleaner working conditions, cleaner machines and increased production efficiency. It discusses "Monday morning odor," the elimination of sludge in a machine, smoke, oily floors, and the nuisance of dermititis.

F. E. Anderson Oil Co., Portland, Conn.

Use HANDY Postpaid Card. Circle No. 7

GOOD SHOPKEEPING (see No. 7)

How to Choose Sandpaper

A 16-page, pocket-size booklet offers help to the shop worker in choosing and correctly using the proper sandpaper for surface finishing of metals, wood, and plastics. Five kinds of grain and their properties are described. Text is illustrated with many photographs and drawings.

Dept. G, Behr-Manning, a division of Norton Co., Troy, N.Y.

Use HANDY Postpaid Card. Circle No. 8

Grinding Wheels

Comprehensive loose-leaf catalog contains information, prices of complete grinding wheel line. Book includes abrasive and bond recommendations for a long list of materials and operations. General service, welding shops, cutting off, woodworking industries, and foundries are covered.

Pacific Grinding Wheel Co., Inc., Everett, Wash.

Use HANDY Postpaid Card. Circle No. 9

Circle No. 222 on postpaid card

Grinding Wheel Balancing

Attractive booklet describes automatic balancing feature for Cincinnati Filmatic plain, roll and centerless grinding machines. It provides precise balancing of the grinding wheel in a few seconds under dynamic conditions with the spindle rotating at its operating speed. Operates from hand control built into the machine. Eliminates vibration due to unbalance and resultant chatter. Permits more effective stock removal.

Cincinnati Grinders Inc., Cincinnati 9, O.

Use HANDY Postpaid Card. Circle No. 10

Microhoning Process

Microhoning removes stock from steel heat treated as high as Rockwell C72. It employs a low-velocity abrading technique. Abrasive is self-sharpening, tool self-aligning. Any desired degree of surface finish is developed. Catalog tells of process and describes Microhoning machines, fixtures, tools, abrasives.

Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, Mich.

Use HANDY Postpaid Card. Circle No. 11

Diamond Wheels

Three grades of bonds have been developed for the diamond wheels described in a 30-page catalog (No. 3D). They provide for all types of grinding of tungsten carbide tipped tools. Four diamond concentrations are presented. When small stock removal will permit the use of lighter concentrations, diamond wheel expense may be reduced. Catalog contains helpful suggestions for diamond wheel users.

Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N.J.

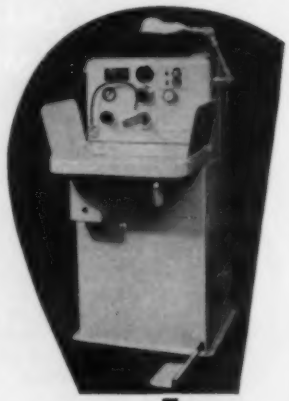
Use HANDY Postpaid Card. Circle No. 12

NO OTHER MACHINE GIVES YOU THIS NEW HONING PERFECTION

The New Model H. M.

HONEMASTER

THE GREATEST ADVANCE IN MANUAL HONING



- **Improved Control**
- **Greater Accuracy**
- **Infinitely Variable Speed**
- **Better Work Always**

—all yours only with this, the latest addition to the line of Superior Honing Equipment.

- Adjustable stone pressure control.
- Hydraulic system assures constant pressure with no fall off due to stone wear or stock removal. Constant cutting action always.
- Infinitely variable spindle speed 250 to 1150 rpm. The right speed and stone pressure for work of any diameter, material or finish. Easy-to-read tachometer.
- Single control sizing dial indicator shows when first piece is coming to finish size. Set, and then compensate only for stone wear thereafter.
- Hydraulic system also operates clutch and brake mechanism.
- Spindle has replaceable hardened pilot bushing, mounted on factory-sealed bearings. Eliminates constant lubrication.
- Foot and knee operating pedals.
- All standard Superior mandrels adaptable.

SUPERIOR HONE CORP.

1637 Elreno Street — Elkhart, Ind.

Please send full details and prices on the Honemaster.

NAME .....

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NAME OF SUPPLIER .....

Circle No. 223 on postpaid card

Optical Comparators

This booklet describes briefly the function and operation of optical comparators. A concentrated, parallel beam of light is directed upon the part to be inspected. The resulting shadow is magnified by a lens system and projected upon a viewing screen by a mirror. Here, the enlarged shadow image can be inspected and measured easily and quickly by comparing it with a master chart or outline on the screen.

Jones & Lamson Machine Co., Springfield, Vt., Dept. 710-D.

Use HANDY Postpaid Card. Circle No. 13

Single Point Diamond Tools

Diamonds set cold without heat or pressure are described in a four-page leaflet. Coldset diamonds are not softened by oxidation, internal flaws or cracks are not expanded. Diamonds can be reset over and over again without damage to the stone; are discarded only when they're too small for resetting.

American Coldset Corp., 87 Court Street, Paterson 3, N.J.

Use HANDY Postpaid Card. Circle No. 14

Precision Tumbling

Slide honing is the subject of this revised brochure. Parts previously considered impractical to finish in tumbling machines are claimed to be successfully handled by the BMT multi-barrel slide-honing unit. As many as 14 different barrels, each containing a separate part, media and compound, can be mounted on the 48″ revolving disc. A variable rotating speed from 11 to 28 rpm is possible.

BMT Mfg. Corp., 110 E. 9th St., Elmira Heights, N.Y.

Use HANDY Postpaid Card. Circle No. 15

Height Checking Instrument

Hite-Chek No. 584, 12″ range, for precise transfer of height settings, is of solid construction, making it especially suitable for the transfer of extremely close measurements for which lighter, less rigid instruments are not suited.

Leaflet available from Brown & Sharpe Mfg. Co., Providence, R.I.

Use HANDY Postpaid Card. Circle No. 16

Loose Diamonds

In simple language and with line drawings the bulletin entitled "Loose Diamonds" tells the reader how industrial diamonds are assorted for characteristics and industry needs, gives general background information on sizes, uses, and diamond terminology.

Diamond Tool Research Co., Inc., 380 Second Ave., New York 10.

Use HANDY Postpaid Card. Circle No. 17

Motorized Hopper Units

Hopper units made in six diameters, 8″, 10″, 12″, 16″, 24″, and 30″, for handling various sizes of parts, are presented in attractive catalog. Motor is of special design to fit housing, 1/12 hp on the smaller units and 1/6 hp on the 24″ and 30″ hoppers, turning 1725 rpm, designed for constant running. Drawings and photographs illustrate various applications.

Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Mich.

Use HANDY Postpaid Card. Circle No. 18

Profitable Advertising

Section I of "Profitable Advertising for Small Industrial Goods Producers," Small Business Management Series No. 18, is addressed to owners and top executives. It discusses functions of advertising, setting advertising objectives, organization for advertising, etc. Section II is written for advertising managers and deals with the advertising agency, setting up and running an advertising program, business-paper advertising and publicity, measuring advertising results, etc.

Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. Price of publication is 35 cents.

Report for Engineers

"Professional Standards and Employment Conditions" comprises an analysis of problems of current employment conditions as they relate to the individual engineer, and suggests solutions. Responsibilities of employee, management, engineering society, and engineering educator are covered.

Engineers Joint Council, 29 W. 39th St., New York 18.

Use HANDY Postpaid Card. Circle No. 19

VISUAL GRIND

TOP FIRMS SHOW
PROVED SAVINGS UP TO 75%
IN SET-UP AND GRINDING TIME WITH CONTINUOUS WORK INSPECTION AND INFINITE PRECISION

Working with TUNGSTEN CARBIDE, STAINLESS STEEL, STELLITE or TOOL STEELS—VISUAL GRIND will permit a semi-skilled operator to grind precision pieces without continued checking with the tool room—since this function is done by the built-in optical comparator. Fill in the coupon below—let us show you how VISUAL GRIND will speed production—cut costs.

Fill in this coupon NOW

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THE CLEVELAND GRINDING MACH. CO.
1643 Eddy Road Cleveland 12, Ohio

Gentlemen:

☐ Please have your representative call at our plant. The most convenient time would be (week) .....

☐ Phone for appointment.

☐ Please send us complete information on the NEW VISUAL GRIND.

NAME..... TITLE.....

COMPANY .....

ADDRESS .....

Circle No. 224 on postpaid card

Hydro-Mechanical Devices

Presented in Bulletin 22-A are two series of hydraulic cylinders, of different ratings, which use a single screw thread to retain the cylinder heads to the cylinder body. Because of this method of attachment, the proven strength of the thread is claimed to be most advantageously employed, and components are smaller in size.

Pathon Mfg. Co., Pacific Ave., Cincinnati 12, O.

Use HANDY Postpaid Card. Circle No. 20

Air, Liquid Cleaning Equipment

Folder M-133 lists and describes the manufacturer's line of blowers, exhausters, pneumatic systems, filters, flotation equipment, separators, stills, tubular pipe and fittings, and vacuum cleaners.

U. S. Hoffman Machinery Corp., 103 Fourth Avenue, New York 3.

Use HANDY Postpaid Card. Circle No. 21

Hardness Testers

To describe the functions of the Tukon testers for micro and macro hardness testing, the manufacturer has prepared 12-page Bulletin DH-328. They make possible microhardness testing using extremely shallow indentations. Bulletin contains illustrations of the three models, listing vertical capacities, load in grams, weight, principal applications.

Wilson Mech. Instr. Div., American Chain & Cable Co., Inc., Bridgeport 2, Conn.

Use HANDY Postpaid Card. Circle No. 22

Pneumatic Grinder

The Whirlwind pneumatic bench grinder has a spindle which is fitted with a ½" dia. hole collet permitting the use of a standard ½" abrasive stick, for getting into small places. Unit has speed of 55,000 rpm. End of stick can be dressed to any desired shape. Catalog also contains information on air line filters, regulating valves, air line lubricators.

M-B Products, Inc., 46 Victor Ave., Detroit 3, Mich.

Use HANDY Postpaid Card. Circle No. 23

Twin Belt Surfacing Machine

Bulletin No. F18 announces a twin belt surfacing machine using opposed abrasive belts backed by platens, as the cutting medium. Properly tooled, this machine may be used for a wide variety of applications where opposite sides of stock require a grinding or finishing operation. Two operations (grind, sand, surface polish, or deburr) in a single pass.

Production Machine Co., Greenfield, Mass.

Use HANDY Postpaid Card. Circle No. 24

Tumbling Equipment

Perforated catalog sheets are available which present various types of tumbling equipment: Mini-Tumbler bench tumbling barrel; portable tumbler-mixer; precision barrel finisher; Super twin barrel finisher; Vari-Load barrel finisher; barrel with three removable covers; V8 barrel finishing machine.

Rampe Mfg. Co., Cleveland, O.

Use HANDY Postpaid Card. Circle No. 25

Centers and Grinder Dogs

This fully illustrated catalog of the Red-E line of cylindrical grinding machine and lathe centers, as well as grinder dogs, introduces several new centers. It also contains a grinding machine chart for correct selection of center taper specifications, a master chart for center hole design.

Catalog No. CD-56, Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn.

Use HANDY Postpaid Card. Circle No. 26

ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

WRITE FOR FACT-PACKED ROTO-FINISH CATALOG NOW

Roto-Finish COMPANY

3730 Milham Road, Kalamazoo, Michigan
Originators of the Roto-Finish Process

P.O. Box 988
Phone FI 3-5578

Circle No. 225 on postpaid card

Van Norman 4B61 Bowgage Production Grinder

Van Norman Machine Company recently announced the 4B61 single head plunge cut Bowgage production grinder, which features the Bowgage wheelhead unit.

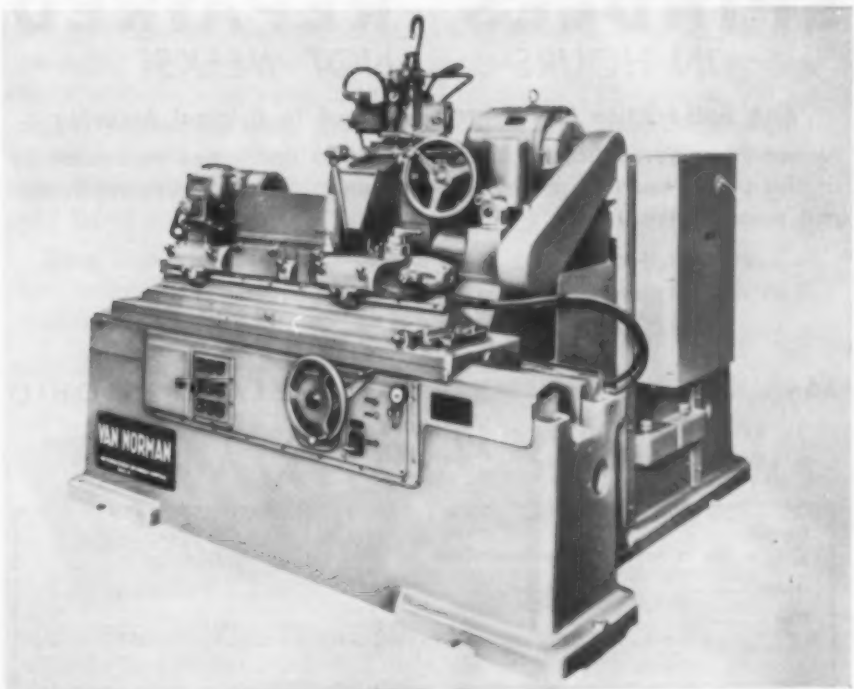
The completely automatic integral grinding unit incorporates gaging, rough and finish feeds, and automatic cycle with rapid traverse.

By taking the Bowgage wheelhead and mounting it on a suitable base, there are a number of diameters, tapers, shoulders, etc. that can be ground automatically. The 4B61 is available in two sizes—10" x 24" and 10" x 36". Maximum swing over table 10"; maximum diameter grind 6".

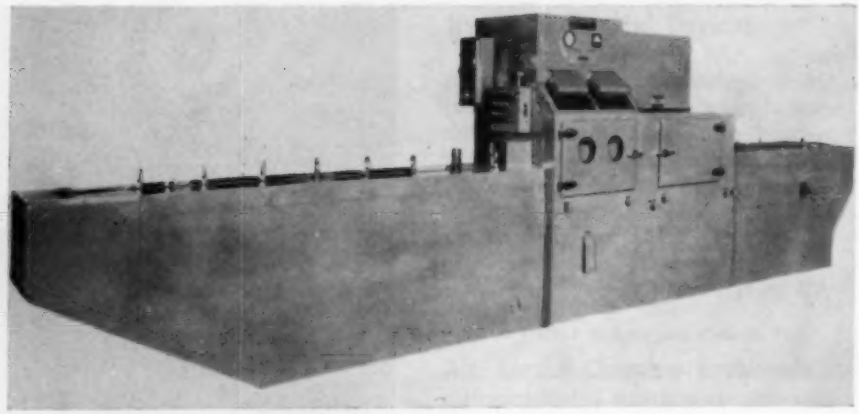
Maximum distance between centers is 28½"; headstock speed range 50 to 600 RPM; size of motor ½ to 1½ HP; wheelhead spindle speed 830 RPM; wheelhead motor size 7½ to 10 HP; Grinding wheel 30" x (¾" to 6") x (12" x 20"); Automatic wheel feed 0" to .063"; Rapid traverse 0" to 5"; Range of grinding feed rates infinite; Dwell or spark out time 0 to 5 minutes; angular positioning of wheelhead 0 to 30 degrees, net weight (approx.) 19400 lbs.

Van Norman Machine Co., Springfield 7, Mass. •

Use HANDY Postpaid Card. Circle No. 101



Van Norman 4B61 Bowgage Production Grinder



Conveyorized Wet Blast Unit

A new extended load-area conveyorized wet blast unit has been announced by The Cro-Plate Co., Inc., Hartford, Connecticut.

Designed for high production deburring of automatic transmission components, the machine automatically deburrs, rinses, rust proofs and unloads at the rate of 360 parts per hour net at 80% efficiency. The load section of the conveyor (to the left) has been lengthened to allow several parts to be loaded in advance, thereby freeing the operator for other duties. Simple alterations in work-holding fixture design and blast gun arrangement make the machine adaptable to the finishing of a wide range of parts.

Use HANDY Postpaid Card. Circle No. 102

All Makes • Types and Sizes High Speed
Precision Boring and Grinding (including Hi-Cycle Units)

SPINDLES REPAIRED

IN HOURS . . . NOT WEEKS!

Also Anti-Friction Live Centers Restored to Original Accuracy

Air conditioned repair center, trained mechanics and immediate availability of all types of bearings required in these units. We guarantee satisfaction and prompt service!

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I'd like to have complete information on your spindle repair service.

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Circle No. 226 on postpaid card

Dry Type Air Filter Introduced

Customer demands for a high efficiency dry type, renewable media air filter has brought about the development of the new Multi-Pak air filter by American Air Filter Co., Inc. The air filter is especially suitable for operating in chemical plants; pharmaceutical laboratories; film, optical and electronics manufacturing plants; atomic energy installations, and many other specialized fields.

The unit was developed for those applications that require air filters of standard construction but need higher-than-normal cleaning efficiencies. Its effectiveness can be regulated by a variety of media, ranging from inexpensive cellulose fiber sheets, through dense, highly effective glass fiber mats. The variety of thicknesses, densities, and textures make it possible to obtain any desired efficiency in dust and smoke removal from plant pollen to tobacco smoke, even at extremely high temperatures and with minimum operating costs, according to the manufacturer. There are more than fifty square feet of media in the seven "pockets" of one 2′ x 2′ x 22¾″ unit—thirteen times more media than face area. Permanent media frames insure a perfect seal and makes media servicing simple and inexpensive.

Copies of Bulletin No. 237 may be obtained from American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Ky.

Use HANDY Postpaid Card. Circle No. 103

"Die Part" Portelvator

A new patented "Die-Part" Portelvator for die holding, fitting and separating during critical die finishing operations has been announced by Hamilton Tool Co., Hamilton, Ohio. Major savings of time and increased efficiency during those operations are claimed for the new unit, intended for use in die and press plants.

Former methods used for these operations involved for most companies the use of a hydraulic press to "pull a pattern" from which to check the fit of punch and die. This included positioning of the punch and die in the press, stamping of the pattern, removal of the punch and die and painstaking separation with pry bars. The punch was then carried to a bench, filed as required and returned to the press for another trial.

The Hamilton "Die-Part" Portelvator now used for this work is of standard construction except for the top plate, which is designed with an integral tilting mechanism which enables the diemaker to perform the necessary filing while the punch is still clamped to the unit's top plate. Pattern trials of the die and punch are taken with the die and punch clamped on the Portelvator. A hand crank applies the pressure for taking the pattern, and the same crank separates the punch and die. Next, transferring the hand crank to the upper position, the special top plate is rotated to a position convenient for filing. Subsequent patterns are made without repositioning the die and punch. Result has been elimination of the men needed to handle the punch and die in and out of the press, a saving of time for the die fitting operation, and release of a hydraulic press for productive work. Hamilton Tool Co., Ninth St. at Hanover, Hamilton, Ohio.

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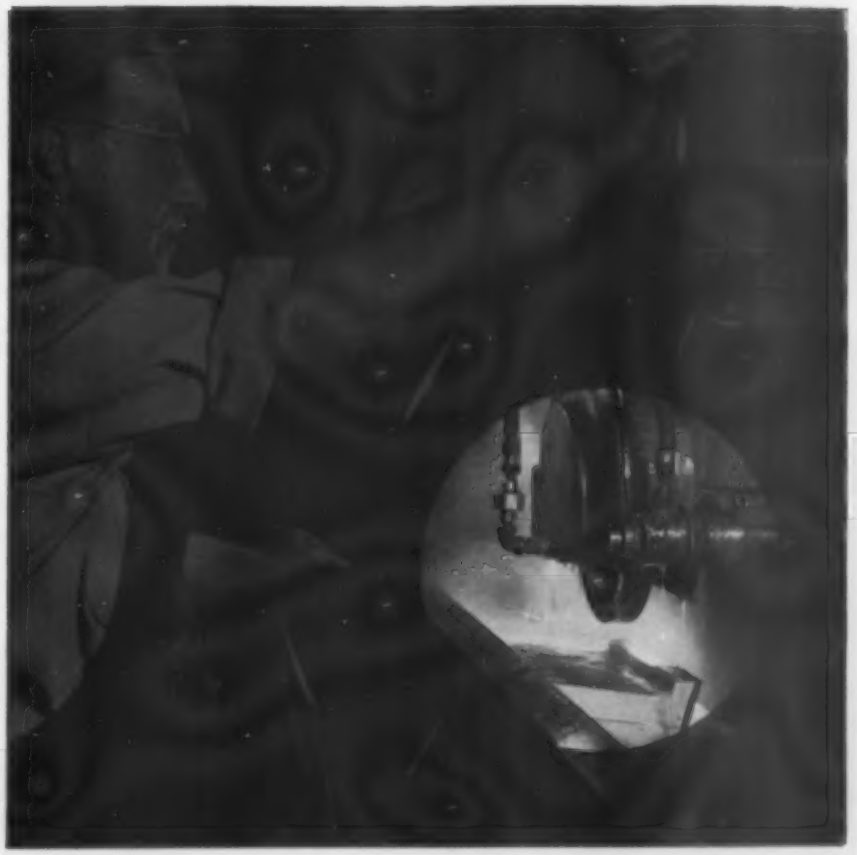

HOUGHTO-GRIND

Oil-Free Chemical Grinding Compound Prevents Wheel Loading, Fights Rust

Houghto-Grind keeps finishes free from grinding cracks and burns caused by wheel loading because Houghto-Grind's high detergent action keeps grinding wheels clean. Freshly ground surfaces won't rust because they are protected by Houghto-Grind's corrosion inhibiting properties. With Houghto-Grind, the operator can see the work 100 percent of the time. This fluid is absolutely transparent, enabling close and continuous observation when grinding to exact tolerances.

Easy to use, Houghto-Grind mixes with water at room temperature, providing a long-lasting, non-foaming, permanently stable solution. Because there is no oil in it, there is no disposal problem. It will not pollute streams or rivers. Even in periods of prolonged use, Houghto-Grind is free from rancidity or unpleasant odors. A special germicide retards the growth of living organisms that might cause poor health and safety conditions.

Your Houghton Man will be glad to give you the full story. Call him today—or write E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.

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HOUGHTON PRODUCTS FOR THE STEEL INDUSTRY • Hydraulic Fluids • Rust Preventives • Grinding Compounds • Special Purpose Lubricants • Heat Treating Materials • Cutting Oils and Bases • Leather and Synthetic Rubber Packings • Pickling Inhibitors

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with J & S guaranteed* self-adjusting live centers

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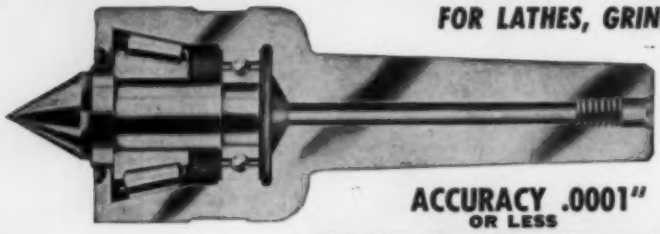

ACCURACY .0001"
OR LESS
with PERFECTION FREE CENTERS
SPINDLE TYPE
***GUARANTEED FOR 2000 HOURS FOR ONE YEAR**

tapered Timken bearings and design accept heavier loads with guaranteed accuracy.

SIMPLE DESIGN:

Only six parts, the main body is one piece which serves as the cup for the roller bearing on which spindle turns. This permits a much greater capacity bearing in the same size body.

AUTOMATICALLY ADJUSTS FOR WEAR:

Notice the clearance behind ball bearing which allows the whole bearing assembly to move back, automatically compensating for wear on roller bearing. This maintains center's point to original concentricity.

ABSOLUTE CONCENTRICITY AND ALIGNMENT FOR BEARINGS:

Both conical and cylindrical bores of body are ground at same setting in work head. Point is ground under load in its own bearings to insure running dead true.

Design plus self-adjusting features provide accurate and chatterless grinding.

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2 to 7	6 to 20	7 to 18	10 to 24	.8125 1.3350 1.7500
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J & S TOOL CO., INC. 880 DORSA AVE. LIVINGSTON, NEW JERSEY

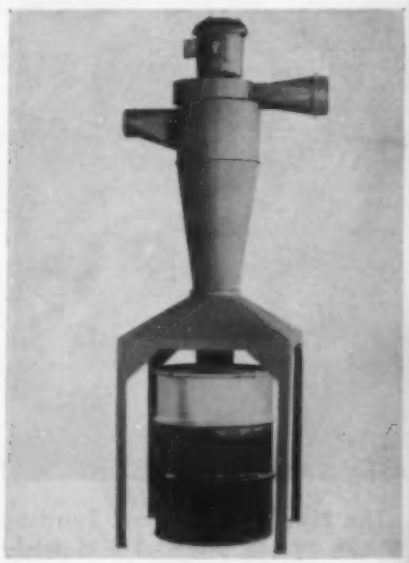
Circle No. 228 on postpaid card

Cyclone Dust Collector Line

A new line of Torit cyclone-type dust collectors featuring connections to standard 55-gallon drums has been introduced by Torit Manufacturing Co., St. Paul, for use in installations where large volumes of bulky, sticky dust are created.

Known as the Series 55 collectors, their exhausting capacities range from 1000 to 1100 cubic feet of air per minute at speeds in excess of a mile a minute. The collectors feed directly into standard 55-gallon (or smaller) drums, which can be quickly removed and replaced when full.

Cyclone-type collectors use centrifugal force to precipitate all but the finest dust particles, up to 95%, the other 5% being exhausted outside or trapped in an efficient after-filter bag. F.o.b. factory prices for the units range from $375 to $448.



Other specifications: height—104"; width—32"; depth—32"; motor—2 hp, 3450 rpm; inlet diameter—6"; outlet diameter—8"; static pressure—2.5" to 2.7" water; shipping weight—440 lbs. to 510 lbs.

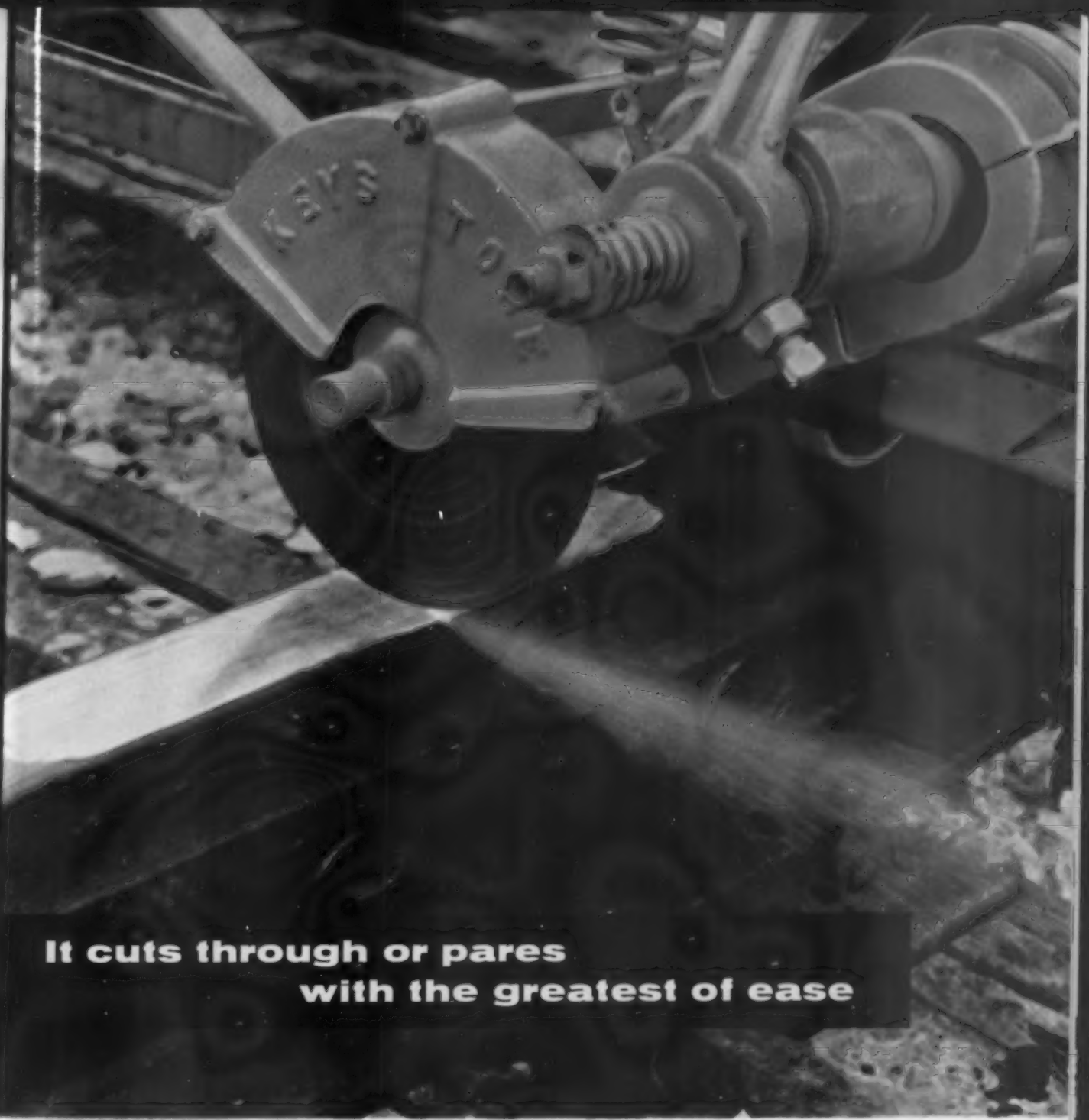
Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn. •

Use HANDY Postpaid Card. Circle No. 188

Sheffield Gage Classifies Retaining Rings in "Tenths"

A new Precisionaire gage that measures thickness and parallelism of half-moon retaining rings at three places and permits size classification in "tenth" (.0001) increments for selective assembly is available from the Sheffield Corporation, Dayton 1, Ohio. Inspection rate is 400 to 500 parts per hour.

The gage consists of a feeding and gaging fixture and a three-column Precisionaire instrument. Mounted on



Rugged jobs that crack ordinary wheels are no problem for CARBOFLEX® Cut-Off Wheels by CARBORUNDUM! The fiber-reinforced resin bond is designed to withstand extremes of side pressure and heat shock. This extra strength means maximum safety…plus two to three times longer wheel life! Both sides of CARBOFLEX® wheels are knurled, to eliminate binding. There's no flexing and drifting, even on long cuts or uneven surfaces. CARBOFLEX® Cut-Off Wheels come in four gradings, in diameters up to 20 inches, for every cutting, notching, slotting job.

A phone call to your CARBORUNDUM Distributor or salesman will set up a trial in your shop. For Folder A-1298, giving applications and recommendations, write The Carborundum Co., Niagara Falls, N. Y. In Canada: Canadian Carborundum Co., Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

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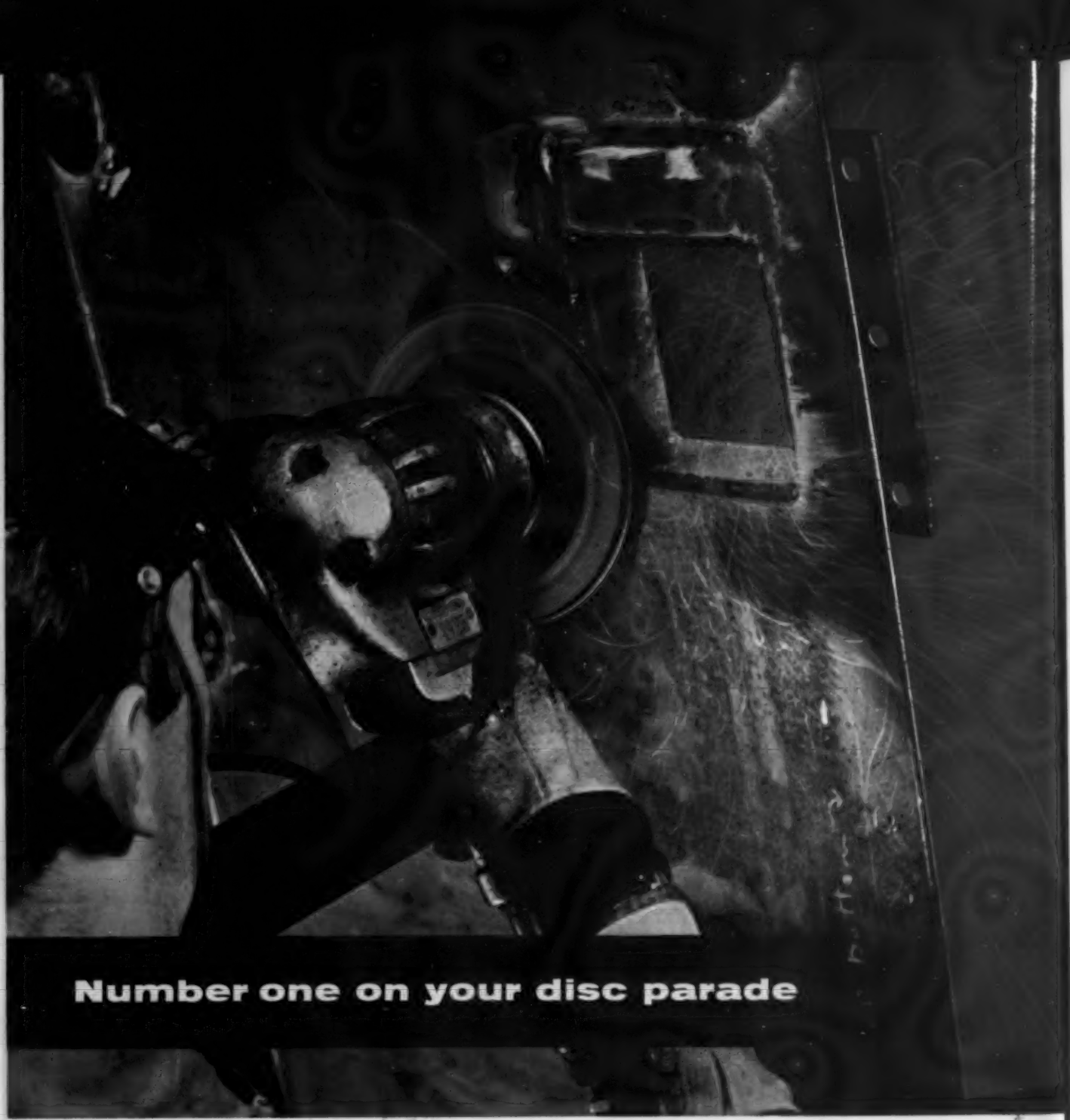

Number one on your disc parade

PHOTOGRAPHED AT DETREX CORP., DETROIT, MICH.

The hardest-working sander disc you can use is the new Resin Sander Disc by CARBORUNDUM. It cuts fast, free and cool, with maximum stock removal at all times. The resin bond is engineered with greater holding power, and a tough new fiber is used in the backing. As a result, Resin Sander Discs resist both edge-wear and the heat of flat contact grinding. You get more work out of each disc—which soon adds up to impressive savings. Another feature: special moisture-resistant packaging means Resin Sander Discs reach you "factory-fresh"—are easier to store and handle. There's a complete range of sizes and types to fit all Disc Sanders, in 16 through 150 grit. For a convincing demonstration, call your CARBORUNDUM Distributor or salesman. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

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continually puts more sense in your abrasive dollar

the bench-type base are a vertical stacking tube for holding the rings and a push-pull feed mechanism for sliding the rings individually under three Plunjet gaging cartridges in the gage station. Each Plunjet is connected to its own air column in the Precisionaire.

The gage is easy to use and does not require a skilled inspector. The operator simply loads the rings onto the vertical stacking tube and by means of the push-pull feed mechanism slides the rings individually into the gage station. As soon as the ring comes in contact with the three Plunjet cartridges the operator glances at the position of the floats in the Precisionaire to see whether or not the ring is within tolerance and size classification. Parallelism is indicated by the relative positions of the three floats in the Precisionaire.

Standard Production Instruments Div., The Sheffield Corporation, Dayton 1, Ohio. •

Use HANDY Postpaid Card. Circle No. 106

Electronic Erosion Machine

To be unveiled at the Cleveland Metal show Oct. 8-12, the Abaco electronic erosion machine operates on a 20% higher cycle than previous models. It will be in operation machining carbide, stainless honeycomb, titanium, etc.

The electronic erosion machine reproduces directly the shape and profile of a soft master electrode in carbide or already hardened alloy through the use of a spark, with a claimed accuracy of ±.0015 and 10 micro inch-finish. •

Use HANDY Postpaid Card. Circle No. 107

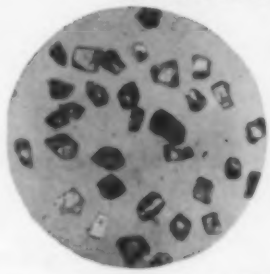
SHORTCUTS in lapping and finishing

New di-met Diamond Compound

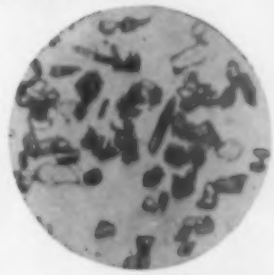
provides faster cutting speeds, far more uniformity, finer finishes!

Di-Met Compound is the result of new diamond crushing techniques which produce large quantities of *compact, chunky particle shapes.* Because of their extra strength and numerous cutting edges these particles produce more work, cut faster and resist breaking down. Unmatched uniformity of size eliminates gouging and scratching from oversized particles, reduces polishing time. Combine these advantages with a vehicle which is not only *water soluble,* but which won't throw off under centrifugal force and waste precious diamonds . . . that's Di-Met Compound . . . *fast acting, economical and easy to use* . . . a *bigger value* for your lapping and finishing dollar!

THESE PHOTO MICROGRAPHS TELL THE STORY



Compare the shapes of the Di-Met diamond particles at left to ordinary diamond compounds at right. Note absence of flats, fines and foreign material. Every particle is properly sized . . your guarantee of a faster, better finish!



This photomicrograph shows why some diamond compounds are slower working. Notice the flats and splinters, shapes which lack strength and break down quickly. The smaller sizes produce no effort whatever, yet cost you at the same rate as the "workers."

Di-Met Carbide Micro-inch Finisher
Newest method for obtaining a micro-inch finish on your carbide and ceramic cutting tools. These finishes can increase tool life as much as 800% with higher cutting speeds and faster feeds. Literature available.

Left: Here's what happens when off-size diamond particles are included. Small particles never make surface contact, large particles produce deep scratches which are costly and time consuming to remove.

Ask for the name of your nearest Di-Met Distributor. He will gladly demonstrate the difference in Di-Met quality—or write for descriptive literature!

ANOTHER PRODUCT OF ELKER RESEARCH
di-met
DI-MET CORPORATION
1873 MULLIN AVENUE
TORRANCE, CALIFORNIA

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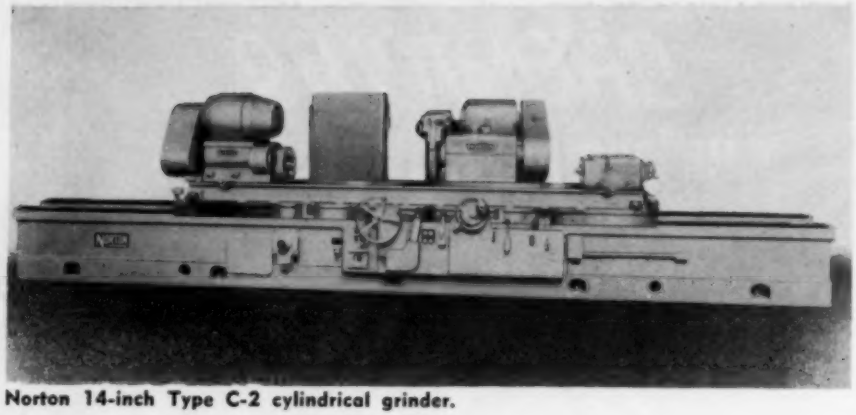

Norton 14-inch Type C-2 cylindrical grinder.

Norton Announces Heavy Duty Grinders

A new line of heavy duty cylindrical grinders has been announced by Norton Company. The 14″ Type C-2 and the 18″ Type LC-2 cylindrical grinding machines are designed to handle workpieces weighing up to 6,500 pounds on centers.

Location of all controls for feeds and speeds on the front of the machine at the operator's position permits a saving of time, particularly in setting-up operations. Another feature is the combination graduated wheel feed hand wheel and "click-count" indexing mechanism. The graduated hand wheel continually indicates the amount of infeed as the wheel rotates past a fixed pointer. The indexing mechanism permits settings in increments of .0001″ work diameter reduction instantly and without visual attention.

Pre-set table truing and grinding speed arrangements are other time and labor saving features. Table speeds for truing and grinding are independently adjustable and pre-set. Either speed is immediately obtained thereafter by movement of a combination selector and table start-stop lever. Continual setting of these speeds is avoided.

Other features include a work jogging lever, centrally located; automatic or manual control of work rotation and coolant flow by setting a selector switch; automatic adjustable wheel feed at table reversals with automatic wheel head resetting and separate dwell controls for each end of table reversal.

Table drive by hydraulic power is available from 2″ to 240″ per minute. The pressure lubricated wheel spindle bearings enclose over 50% of the spindle body for rigidity and resistance to grinding pressures. Metal-to-metal contact in all feeding mechanisms is said to produce fast spark-out and enduring precision.

Pumps, motors, filters, relief, and lubricant flow control valves are placed for convenient maintenance. Electrical controls are grouped in an elevated enclosure. Base ways are protected by steel tape type guards.

The 14″ Type C-2 and 18″ Type LC-2 machines are available as plain grinders or semiautomatics. The semiautomatics have an automatic grinding cycle which operates under simple "one-lever" control. •

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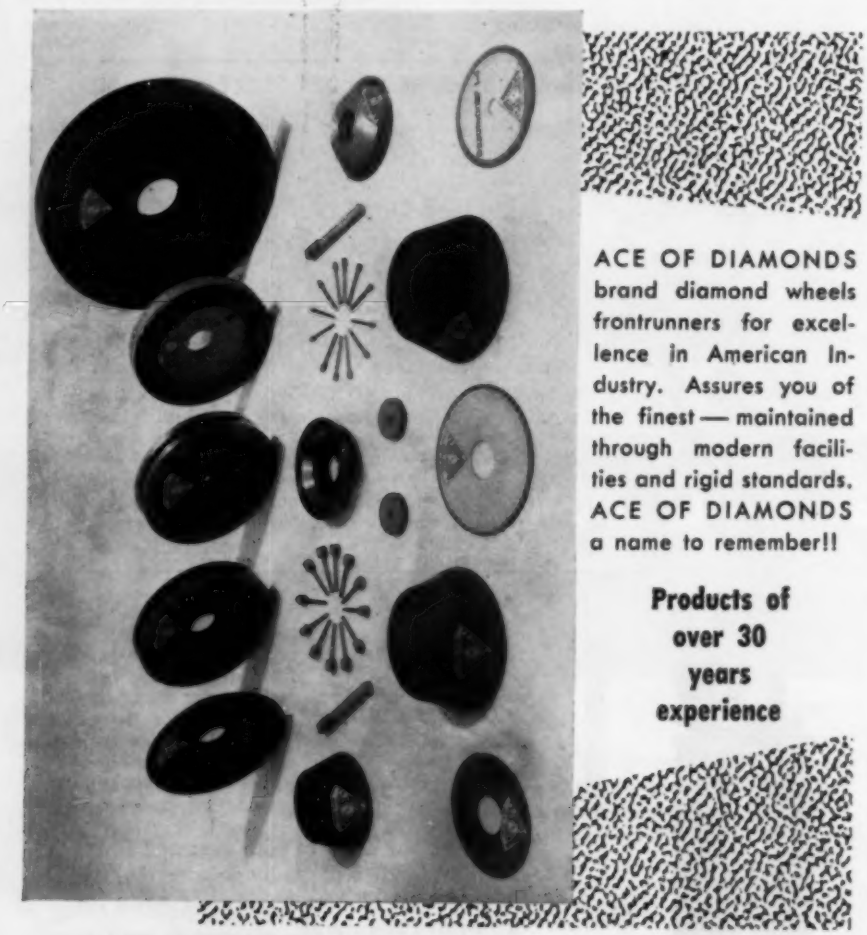

ACE OF DIAMONDS brand diamond wheels frontrunners for excellence in American Industry. Assures you of the finest — maintained through modern facilities and rigid standards. ACE OF DIAMONDS a name to remember!!

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THE PAUL L. KUZMICK CO.

271-279 GROVE AVE., VERONA, N. J

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Continuous Size Control

Increased accuracy in stock removal operations is now being achieved with the Cargill continuous proportional automatic size control unit. Illustrated is a centerless rough grinding operation on a bearing race OD. With an average stock removal of .010, part size is held within the irreducible machine scatter, plus or minus .002. Tests have indicated the control is superior to an operator. This control method eliminates the saw tooth pattern (graphically recorded) inherent with the use of jogging controls.

The Cargill Size Control measures every piece; and the setting of the operating machine—in this case, the wheel position—is influenced by the

Cargill size control unit.

size deviation of each part. Thus, adjustments are continuous and are never large.

Basically, the Cargill control consists of a transducer gaging head, amplifier, and servo-driven transmission. In the installation shown, parts coming from the machine are fed through the gaging head by an auxiliary feed mechanism. For multiple-machine throughfeed applications, the gage head is mounted in line on the parts conveyor. An optional size sorting mechanism directs the sized parts to different chutes. •

Use HANDY Postpaid Card. Circle No. 100

Centerless Double-sewed Unit Cloth Buff

Greater versatility of buffing on stainless steel, carbon steel and aluminum is claimed through use of a new patented centerless unit cloth buff, product of American Buff Company. The "units" of the new buff are sewed double for firm hard cutting. Unit edges are compactly folded upon themselves, giving a sturdy perimeter and leading edge that is said to hold buffing compound longer.

American Buff Co.'s patented "centerless" construction enables this new buff to run at higher speeds without burning or discoloring the work. Instead of being fastened to a solid center, the units are held together by a special gripping "Lok-Tite" steel ring. This leaves space around the shaft through which air circulates.

In mounting the new centerless buffs, a patented "pre-Assembly" method saves time. The proper number of sections can be locked together in advance, and mounted on a special hollow, flanged shaft. Slipping the complete buffing head on or off the machine takes only a few seconds, reducing downtime. Simplified design of the steel clinch ring permits an almost unlimited number of sections to be locked together, to build a buffing face up to twelve inches or even wider. The new buffs are available in a complete range of densities and sizes for any automatic buffing use. American Buff Company, 2414 South La Salle Street, Chicago 16, Ill. •

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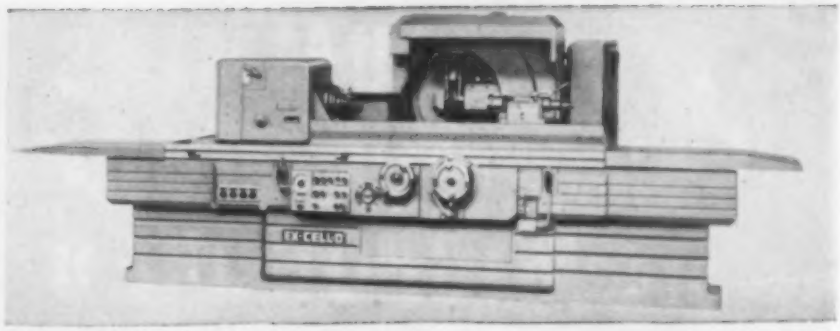

Thread Grinders Meet Precision Needs

Use of ground threads in the manufacture of precision parts for jet engines and airframes, scientific instruments and guided missile weapons is increasing, according to field engineers of grinding machine builders.

Among reasons cited for this development are (1) accuracy required of threads in such applications and (2) hardness of the metals from which these components are made. Titanium, stainless steel and the new hard alloys are examples.

Lead screws, incorporated in various

APPLE POLISHING IS NOT OUR BUSINESS
but METAL FINISHING IS!
and for THAT JOB here's America's finest Medium Priced Line!
STANDARD
Cadet
INFINITELY VARIABLE SPEED, PROPER SPEED, MOTOR DRIVEN
BUFFERS—POLISHERS
IN 16 DIFFERENT TYPES AND SIZES
Top production efficiency in buffing, polishing or coloring with uniform finish in maintaining peripheral speed. Available in 2, 3, 5, 7½ and 10 HP.
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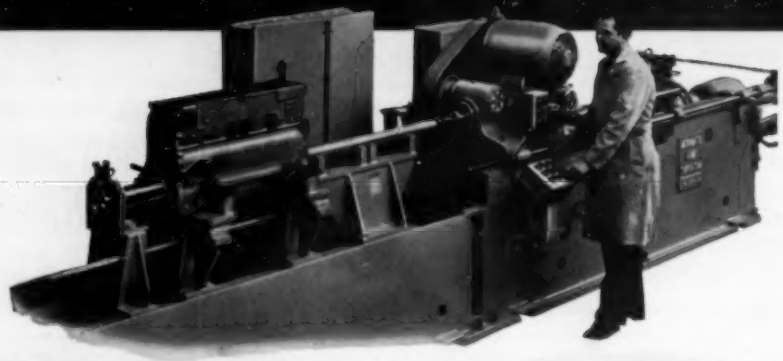
2478 RIVER ROAD • CINCINNATI 4, OHIO

Circle No. 231 on postpaid card

WHY CUMMINS main bearings are MICROHONED

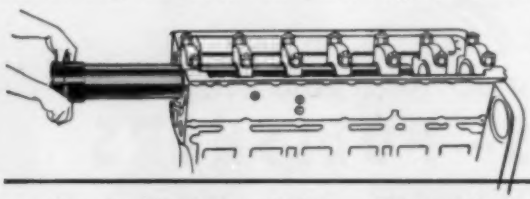


"Cummins diesel engines have a world-wide reputation for dependable, low-cost power. Here at Cummins, we attribute the wide acceptance of our engines to constant searching for better processing methods and improved engine performance.

"For example, if our crankshaft main bearings were undercut at the ends, tapered or out-of-round, then the full load of the journals would be borne by relatively small areas. This would cause bearing inserts to overheat and quickly break down. Also, should the bearings be misaligned, the crankshaft would flex during rotation and cause fatigue failure.

"However, by Microhoning our main bearings we secure *round, accurately-sized* and *aligned bores*. Cummins is the first diesel manufacturer to Microhone its main bearings. The surfaces of Microhoned bearings are clean-cut, free of deformed metal and the finish is consistent in every bore. In addition, the consistent accuracy generated by Microhoning permits us to make faster set-ups and use higher cutting feeds on preceding boring operations—Microhoning automatically corrects all inaccuracies.

"After Microhoning, all main bearing bores are checked with a gage plug 44 inches long and .0007 inch under required bore size. Gage must have a simultaneous slip-fit through all bores in the block. Tolerance for roundness is less than .0002 inch and finish is held to the specified 55 microinches."



Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Circle No. 232 on postpaid card

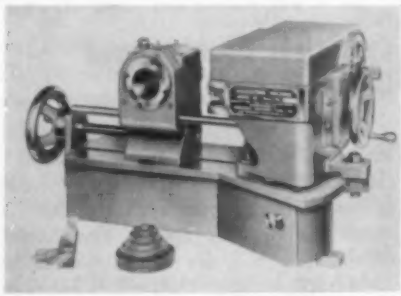
actuating mechanisms, are typical of precision parts using ground threads almost exclusively. These are designed with differing thread forms, in many lengths and diameters.

In one instance, a manufacturer used an Ex-Cell-O thread grinder to produce a lead screw nearly forty feet long with a diameter of 3½". This particular thread grinder is built to hold pitch diameters to plus or minus .0002". Lead tolerances of plus or minus .0002" in any one inch, or plus or minus .0005" in any twelve inches, can be held when grinding any standard thread form. The Ex-Cell-O line presently includes seven styles of thread grinders, of external and internal and universal types. •

Use HANDY Postpaid Card. Circle No. 111

Circular Graduating Machine

Abrasive Machine Tool Company has announced that its circular graduating machine for machine tool dials and hand wheels is now available through dealers throughout the U. S. A. and Canada. Small, simple to operate, the



machine will graduate straight or angled surfaces with from 40 to 1000 graduations, with many combinations of length or line. The machine was designed and developed by Abrasive as an addition to their production equipment for precision surface grinders. •

Use HANDY Postpaid Card. Circle No. 112

Sequence Timer-Recorder for Split-Second Operation Checking

Development of a timing-recording instrument, called the Monitorecord, has been announced by the Sheffield Corp. The instrument is designed for timing and recording as many as fourteen simultaneous operations or sequences to obtain optimum timing of automatic equipment. Production control and maintenance personnel are also able to spot faulty cycles and adjust sequences for most efficient operation. The instrument can be plugged into the electrical control circuit without shutting the machine down, and no other external power supply is required. The unit is portable and may be carried from one machine to another. The start, stop and

duration times of the various sequences are timed and recorded on a five inch chart of pressure sensitive paper. A time scale of .2 seconds to the inch is marked on both sides of the chart with space between lines for making notations. Further details are given in Engineering Data Sheet No. AU-108-56 available from the Autometrology Div., The Sheffield Corp., Dayton 1, O. •

Use HANDY Postpaid Card. Circle No. 113

New Mist Collectors

A compact unit that captures fog, smog and mist from surface, cylindrical and thread grinders, lathes, screw machines, and other machine tools using cutting oils has been developed by Hammond Machinery Builders, Inc., of Kalamazoo. Named the Hammond MistKolector, the machine is offered in two models and in four motor sizes, with volume ranging from 525 to 2685 cubic feet per minute, and motor H.P. from ½ to 5.

The machine requires a minimum of floor space and can be suspended from the ceiling if floor space does not permit installation.

Replacement of filter is simple in that only a sheet metal cover has to be removed. Advantages claimed for the MistKolector are: cleaner air for the employees; a cleaner plant; reduction of painting and maintenance costs; and reduction of fire hazard. Hammond Machinery Builders, Inc., 1651 Douglas Ave., Kalamazoo, Michigan. •

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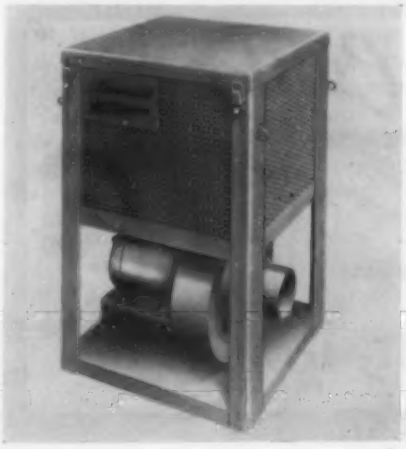
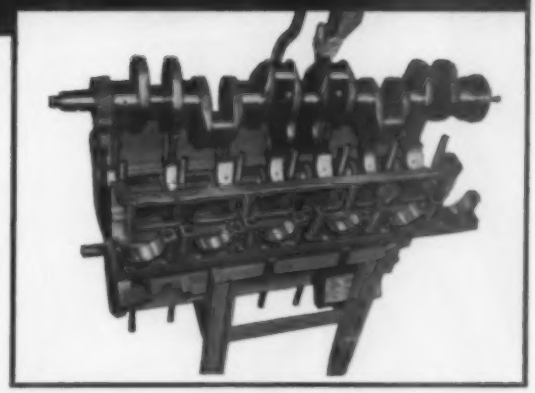
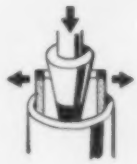


HOW MICROHONING generates round, accurate, aligned bearing bores



All types of cylindrical surfaces, including small diameters and combinations of soft and hard metals . . . interrupted by keyways, undercuts, ports, reliefs or cross holes . . . can be economically Microhoned to precision tolerances and alignment.

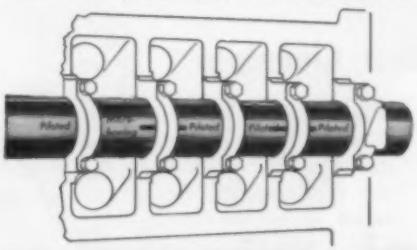
A typical example of Microhoning interrupted cylindrical surfaces is the Cummins Diesel Engine application. Here's how Microhoning generates accuracy and alignment in the crankshaft main bearing bores:



1. Cutting pressure is applied radially from the center of the Microhoning tool body. Abrasives and guides both are expanded by the same feed force, and wear at the same rate.

2. Abrading action is divorced from the effects of spindle or driveshaft vibration and misalignment by a universal joint that is between tool body and driveshaft.

3. The single bank of abrasives travels through all bores on every stroke. As abrasives are Microhoning one bore, the tool is piloted by the plastic guides in the other bores.



The principles and applications of Microhoning are thoroughly explained in a 16mm, 30-minute sound movie, "Progress in Precision". We'll be glad to reserve a print for your use.

☐ Please send me "Progress in Precision" in time for showing on_____(date).

☐ Please send Microhoning literature; I am interested in the following application_____

NAME_____

TITLE_____

COMPANY_____

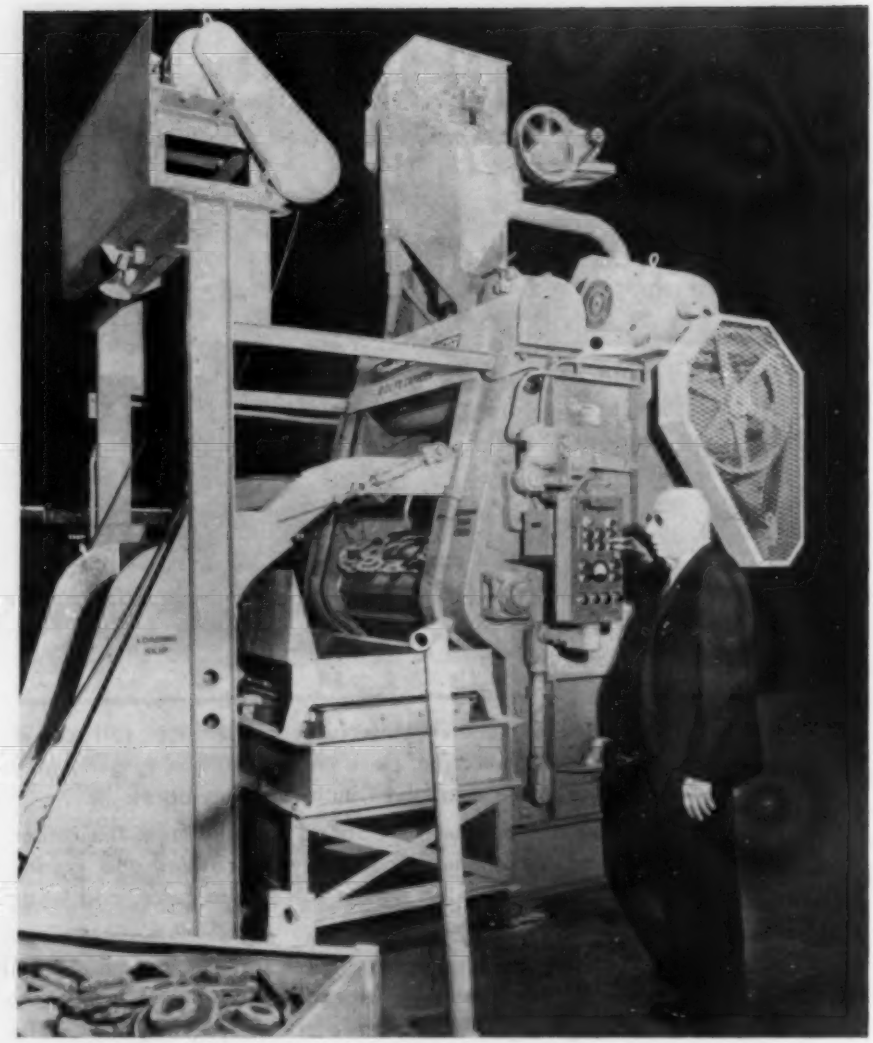
STREET_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Circle No. 233 on postpaid card



Loading skip bridges unloading conveyor when raised to deliver rough castings to Blastmaster barrel. Entire cleaning cycle is automatic including material handling. But each phase can be controlled separately, if needed, by push-buttons on control board.

Automation Applied To Blast Cleaning

A fully automatic Blastmaster barrel is now offered by Pangborn Corporation for use in foundries, forge-shops, heat-treating plants and other metal-working factories which must clean and descale parts in large volume. All operations of the Blastmaster barrel including material handling, weighing, starting and stopping the rotation of the barrel are automatic.

In a large operation with high volume production several automatic Blastmaster barrels can be ground in a line receiving dirty castings from the shake-out by way of a conveyor feeding the loading skip at each machine. After the cleaning cycle, a common conveyor serving all the barrels in the group would take the clean, descaled parts to the next operation.

The detailed cycle of operation begins with the loading of the skip by the incoming conveyor. When a load of predetermined weight is in the skip, a switch automatically stops the feeding conveyor. When the blasting cycle in the barrel is completed and the load discharged, the skip is automatically raised which dumps the dirty castings into the barrel. The skip returns to the loading position and is immediately filled with another load of dirty castings. The door of the barrel shuts, the barrel begins to rotate, the Rotoblast wheel begins to throw abrasive. After a predetermined period, the Rotoblast wheel stops and a short period of tumbling takes place, to drain abrasive from work. The barrel stops, the door opens, barrel reverses direction, and the cleaned castings are dumped out of the barrel onto another conveyor which takes the castings to the next step in processing. The skip dumps in a new load and the cycle is repeated.

All of the steps in the cycle are controlled automatically. However, the blasting cycle can easily be changed to suit cleaning time required.

The 12 cu. ft. Blastmaster Barrel shown is equipped with a Rotoblast wheel 19½ inches in diameter with 3 inch throwing vanes. A 15 HP motor drives the wheel which can throw 24,000 lb. per hr. of shot. A self-cleaning dust collector controls the dust created by cleaning.

The automatic Blastmaster barrel can be furnished in four sizes 6, 12, 18 and 27 cu. ft. •

Use HANDY Postpaid Card. Circle No. 118

These improved NIELSEN live centers for **grinders** are fitted with deflectors to protect bearings from grinding compounds. Have adjustment to take up wear and preload bearings.
This special **grinding** center available with any size point desired. Any size or type taper shank. Complete details and folder furnished on request.

Live Centers

Nielsen, Inc. Lawton, Mich.

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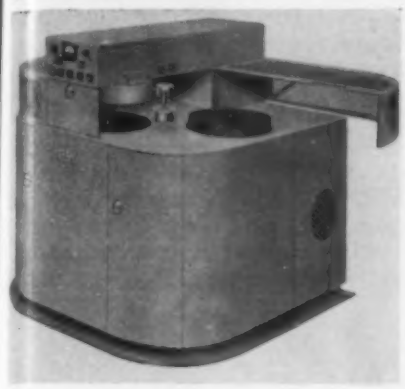
Spin Test Machine



A new automated spin test machine for cut-off saws and grinding wheels has been announced by George L. Day Co. Called Autospeeders, they are being used for one-at-a-time testing at controlled speeds up to 15,000 rpm; they are being integrated into production lines to provide 100% tests of production runs.

These machines load, spin, and unload automatically. Acceleration and deceleration rate is adjustable.

Specially designed vacuum transfer arms handle porous or dense abrasive cut-off saws up to 20" diameter individually without damage to edges.

Machines operate only when safety housings are closed. Controls are conveniently grouped on front panel.

George L. Day Co., 1227-1231 Niagara St., Buffalo, N.Y. •

Use HANDY Postpaid Card. Circle No. 116

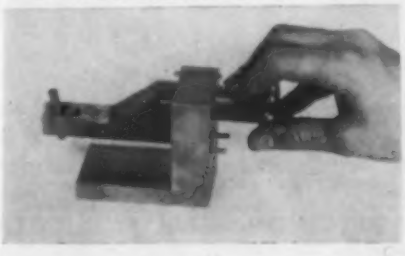
Radius Dresser

Somerset Tool Company has announced a new model dresser said to be accurate to .0002". Designed for bench surface grinders, the Somerset "JR" radius dresser shapes and dresses grinding wheel radii, either concave or convex or combinations of both.

Developed after 14 years of field testing with the basic model, it is simple to operate. Any thickness wheel can be dressed, up to and including ½" thick. There is no need to remove the guard as the wheel is dressed from below so that the operating is easy to see. Stop pins allow complete adjustment from 90° through 180°. The diamond dressing point is simply set by measuring with a micrometer from top of measuring hood to bottom of dresser arm.

Somerset Tool Company, Virginia Street, Hillside, New Jersey. •

Use HANDY Postpaid Card. Circle No. 117



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Constantly increased sales of our products are the best testimony of their quality.

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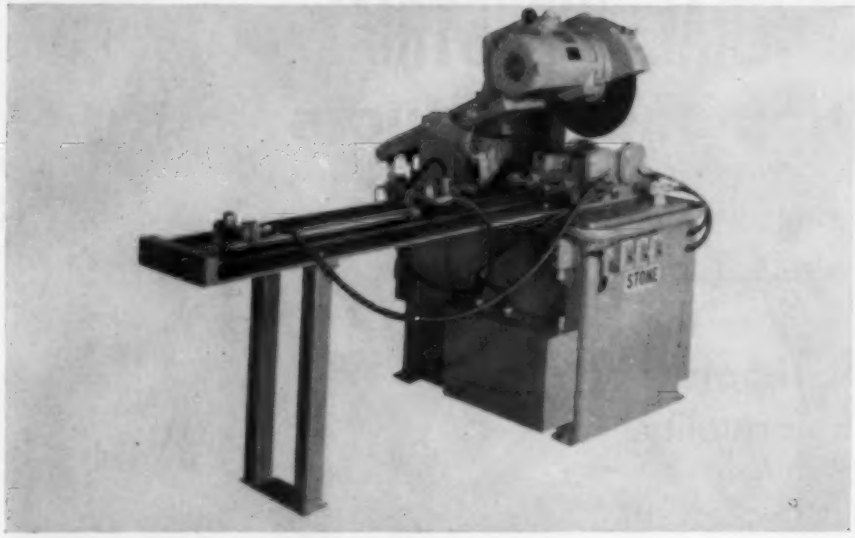


Stone Cut-off Machine Equipped for Automatic Production Work

The new Stone M-75 cut-off machine, specifically designed for cutting ferrous metals, is now equipped with fully automatic bar stock feed and power stroked head for completely automatic production line work.

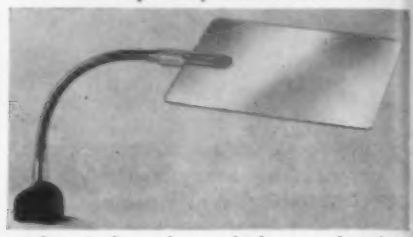
Speeds of 550 cuts per hour are maintained during production runs, with tolerances held to less than .005". Work is turned out with a milled-like finish, eliminating need for further machining. The machine has a wheel wear compensator which adjusts for fast approach and regulated speed of cutting operation by hydro check.

The cutting head is engineered with geared-in-head positive drive that delivers power to the cutting wheel. The M-75 is said to cut 1½" solid rounds with ease. Stone Machinery Co., Marcellus, N.Y.

Use HANDY Postpaid Card. Circle No. 118

Flexible Arm Eye Shield

The Standard Portable Cord Co. has announced the manufacture of a new model of their magic eye shield. Now equipped with a flexible arm, the new model is especially suited for use on



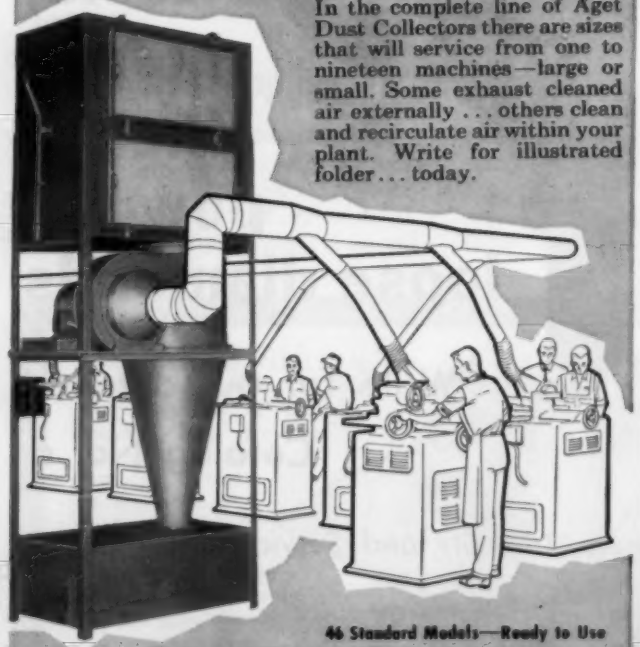
tool grinders, large lathes and other machinery where a mounting location is not available close to the work. The unit incorporates the standard 10"x12" CO-4 cast optics shield and the usual 45 lb. lift Alnico V guaranteed permanent magnet base. The flexible arm is 12" long. The shield is also available with a permanent mounting fixture in place of the magnet base. More information can be obtained from the Standard Portable Cord Co., Mayville, N.Y.

Use HANDY Postpaid Card. Circle No. 119

just ONE DUSTKOP STOPS DUST

heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
1380 Church Street • Adrian, Michigan

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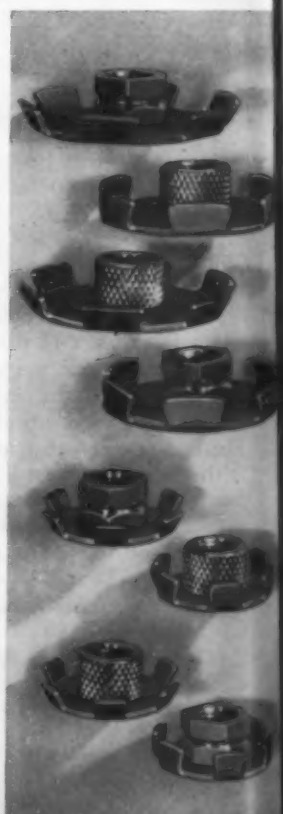
GET THE
"Grip of Steel"
IN YOUR
Grinding Wheel!

Here's *tremendous* new gripping power . . . in the CARROLL-LOCK insert that adds *extra* torque and safety (up to 1500%) to grinding wheels.

Insist on it in the wheels you use. Make sure you have its sure-fire safety and SALES POWER in the wheels you make. Investigate now!

Send for the illustrated catalog today.



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138 DEWEY ST., WORCESTER, MASS.
OVER 50 YEARS OF PRECISION METAL FABRICATION

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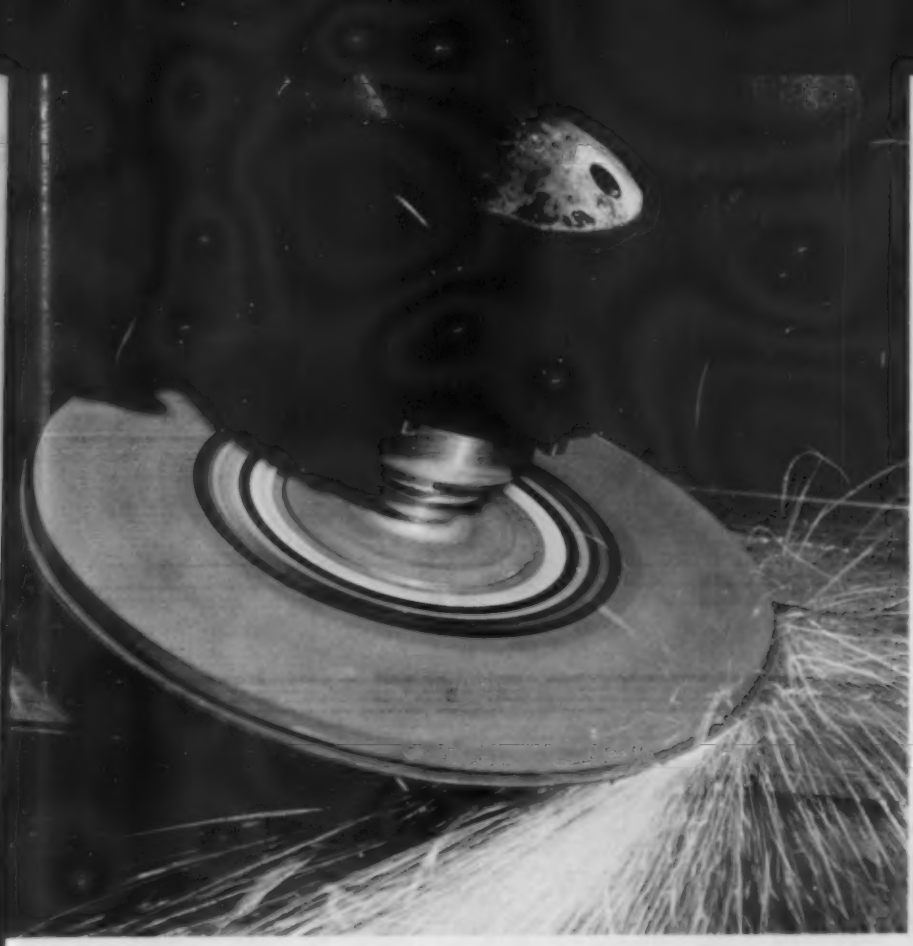


JOB-RATED Type "C" DISC

The sensational new 3M Type "C" Disc is stronger, sharper and longer-cutting than any other disc of its type on the market today. It's *shape-controlled* and *job-rated* (for edge sanding, flat sanding or solder sanding) to fit your specific operations. It's the top quality disc that eliminates problems of disc cupping and breaking—assures you highest consistent performance.

NEW... from 3M COMPANY Research

a portable metal grinding and finishing team

PORTABLE "PG" WHEEL

The amazing new portable "PG" Wheel is the finest, most revolutionary, metal-polishing tool available—designed to replace set-up wheels, felt wheels, rubber bonded polishing wheels, greaseless compound wheels. It's *self-conforming* to curves and contours . . . retains its shape *throughout* its working life . . . needs no breaking in or dressing. It cuts costs, increases production, improves finishes.

3M's NEW PORTABLE TEAM

JOB-RATED
Type "C" Disc

SHAPE-CONTROLLED — amazing new treatment during manufacture gives new 3M Type "C" Discs the best resistance to effects of humidity and temperature of any disc in the world (see chart, overleaf).

JOB-RATED—new 3M Type "C" Discs are now job-rated for specific work . . . edge sanding . . . flat sanding . . . solder sanding or oil filling operations. This advance results from 3M's pre-eminent position in quality control. New controls on fibres—constant improvements in resins—are just two of the factors making it possible. Most important, in shape-controlling *and* job-rating is 3M's miraculous new coated abrasives making machine—the world's largest and most modern—which controls quality to a degree impossible to equal elsewhere.

Shown in picture above is the amazing new 3M Type "C" Disc at work on a hot-rolled high t steel transport tank at the Standard Steel Works, Kansas City, Missouri. Here, a test was cond on weld grinding performance of the new "C" Disc, Grit #36 vs. performance of a standard "C" Grit #36. Results: the new 3M Type "C" Disc removed stock 25% faster—lasted 10%-15% l

Shown above, the remarkable new portable "PG" Wheel is blending a weld on a stainless steel dairy tank at the Standard Steel Works, Kansas City, Missouri. Here the weld is to be blended with a #4 finish on the tank (shown covered by a protective tape). Formerly, this manufacturer was using set-up wheels for this operation—found them slow, unsatisfactory. The portable "PG" Wheel increased production —did a better blending job than was ever before possible.

PORTABLE
"PG" WHEEL

PORTABLE—this smaller version of the standa "PG" Wheel is a remarkable new metal-poli ing tool, ideally suited for both portable a bench grinding machines. Formed of die- segments of cloth-backed 3M Coated Abrasi bonded with resin and locked into a hub.

SELF-CONFORMING—the new portable "P Wheel makes filling a problem of the past b cause its coated abrasive cannot become fill The mineral grains *and* backing wear aw together—conforming to the shape being p ished—and presenting an always new surface the work. The portable "PG" Wheel is perfe for rust or dirt removal, blending disc-sand patterns, weld polishing, metal-feather edgi *and* soft-metal polishing, tar-grinding or remo ing runs and sags on fibre glass.

AN*bsoletes other metal grinding and finishing methods with far greater speed and savings like these* ▼ ▼ ▼

GE SANDING welded corners of steel net units with the *new* 3M Type "C" Disc. Underwood Company, Pittsburgh, Pennsania, finds that Grit #60 "C" Discs vide fast cut-down of excess weld metal, e moderate scratch pattern for easy matchto a standard #4 finish on the unit.

FLAT SANDING welds on steel refrigerator cabinets with *new* 3M Type "C" Disc at Midwest Manufacturing Corp., subsidiary of Admiral Corp. Manufacturer finds *new* "C" discs tailor-made for his moving line operation —finds too, that down-time for disc-changing is cut to a minimum.

SOLDER SANDING and weld grinding on various areas of assembled funeral caskets. The Cincinnati Coffin Company, Cincinnati, Ohio has found that the new job-rated "C" Discs cut faster—fill less—and last up to 50% longer than the discs they had previously used for these operations.

EXIBLE SHAFT refinishing of used aluminum craft propeller blades with a portable "PG" heel. American Airmotive Corp., Miami, orida finds the "PG" Wheel ideal for restorg blade finish. The "PG" Wheel outlasts the -up wheels previously used by a ratio of 20 1—*and* works faster.

FIXTURE-HELD FLEXIBLE SHAFT blending of inside diameter of steel turbine center with a Grit #120 portable "PG" Wheel. Twin Disc Clutch Co., of Rockford, Illinois, found the new "PG" Wheel ideal for this operation as it conforms itself to follow the contour of the turbine center —performs the blending operation in one pass.

BENCH GRINDER polishing of farm machine part with a Grit #150 portable "PG" Wheel. Minneapolis Moline Co., Minneapolis, Minn., had difficulty removing sharp edges—parts' shape made set-up wheel or belt polishing hard. "PG" Wheel cuts, polishes in 1 operation *and* conforms to forgings' small radius.

In the above pictures, protective guards have been removed for photographic purposes

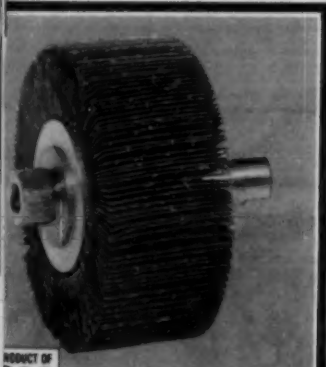
SPECIFICATIONS

Job-rated, shape-controlled 3M type "C" DISC

PRODUCT OF 3M RESEARCH

	15% relative humidity	45% relative humidity	60% relative humidi
OLD Type Discs	5.0	2.0	1.8
NEW 3M Type "C" Discs	2.5	0.5	0.0

3M Portable "PG" WHEEL



PRODUCT OF 3M RESEARCH

Wheel Diameter	Grits	Width	Recommende Speed—RPM
6"	50 thru 320	1-1½-2-2½-3	5,000
7"	"	"	4,500
8"	"	"	4,000
9"	"	"	3,500
10"	"	"	3,000
11"	"	2-2½-3	3,000

3M ABRASIVES

Made in U.S.A. by MINNESOTA MINING AND MFG. CO., General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City. Makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

MINNESOTA MINING AND MANUFACTURING CO.
Dept. AK-96, St. Paul 6, Minn.

- ☐ Rush me full facts on the new job-rated, shape-controlled "C" Disc
- ☐ Rush me full facts on the new portable "PG" Wheel
- ☐ Please have a 3M Representative call

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE...STATE.....

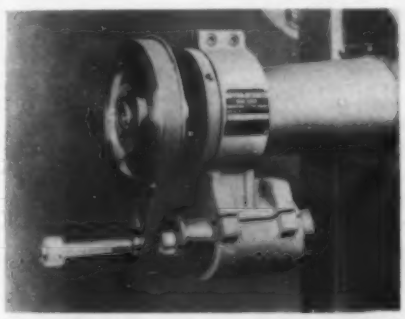
Portable Slide-Abrader

The Handee slide-abrader announced by the Chicago Wheel and Mfg. Co. is engineered for deburring and finishing small parts. The machine has a three-speed drive, an automatic timer and is portable. All conventional types of tumbling media and compounds can be used with the machine for the exact finish required. Write to Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Chicago, Ill. •

Use HANDY Postpaid Card. Circle No. 120

High Speed Grinding Attachment

The Boyar-Schultz Corporation announces a new high speed grinding attachment for use with surface grinders for grinding angles or slots too small to permit the use of standard size grinding wheels; and for grinding serrations, T-slots and many other hard to get at surfaces.



It provides a spindle speed of 14,000 R.P.M.

The attachment mounts on the surface grinder spindle quickly. Belt tension is adjusted through the use of an eccentric bushing. The spindle is equipped with permanently lubricated preloaded ball bearings.

Use HANDY Postpaid Card. Circle No. 121

Cool Grinding Attachment

A new spray coolant attachment, compact enough for mounting on the grinder, has been developed by Reid Brothers Company, Inc. of Beverly, Massachusetts.

Air is supplied from the shop air system by attaching a hose to the snap-on air connection at the rear of the unit. Coolant is stored in a 2½ gallon rectangular tank positioned on the side of the grinder head column. The tank has a transparent face plate for continuous visibility of coolant level.

Components on the air line include a water-filter trap to remove any oil or dirt that may be present in the shop air system; a diaphragm-type pressure regulating valve (manually controlled for the desired fineness of spray); and an air gage, on the outlet of the valve, indicating the amount of air pressure being applied. Operating air pressures are between 5 and 80 psi. depending on spray desired. Direction of the spray is adjustable.

Coolant is regulated by an angle valve at the bottom of the tank. The valve controls the amount of coolant atomized and provides further variation of the spray pattern—air pressure being the other variable.

Any commercial soluble coolant may be used with the cool-grinding attachment. •

Use HANDY Postpaid Card. Circle No. 122

A Coolant that Won't Stain Aluminum!

INTERNATIONAL 131-A

For grinding and cutting aluminum, International 131-A out-performs on every count. This stain-free coolant does not discolor aluminum or its alloys, nor does it react with aluminum dust. A superior finish is assured. In addition, the need for wheel dressings is greatly reduced . . . tool life is substantially increased.

It will pay you to use International 131-A—one of a complete line of non-staining International coolants and cleaners formulated especially for aluminum and other non-ferrous metals.

Write for information today

Specialists in Cleaners and Coolants for Over 50 Years

INTERNATIONAL CHEMICAL CO.

2028 N. MASCHER STREET • PHILADELPHIA 33, PA.

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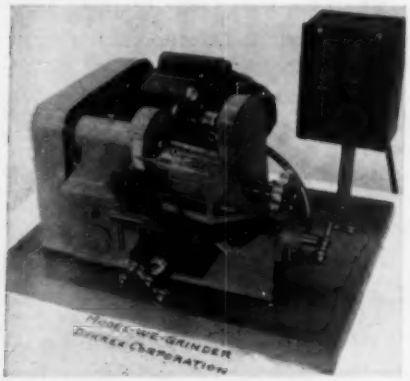
Precision Pin and Small Parts Grinder



Dykrex Corporation of Newark, New Jersey, manufacturers of wire die finishing machinery, has started production on a new low-cost precision pin grinder.

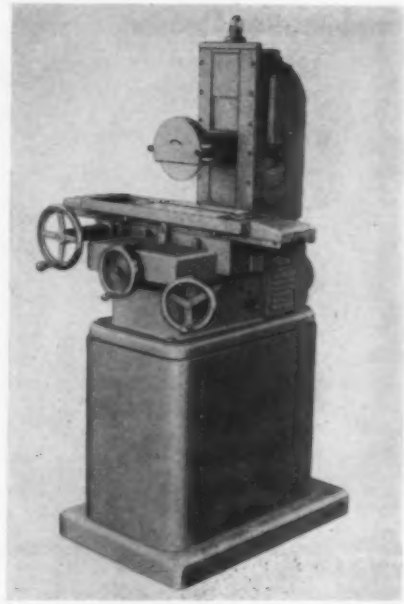
Originally developed for a manufacturer of telephone equipment, the Model WE grinder will grind lapping pins or special parts, up to a 90° included angle.

Dykrex-Roos Corp., P.O. Box 9022, Northeast Station, Newark 4, New Jersey. •

Use HANDY Postpaid Card. Circle No. 123

Low Cost Surface Grinder

A new low cost precision 6 x 12 hand feed surface grinder, the Excel No. 7A, is said to incorporate features heretofore found only in costlier machines. The elevating hand wheel is located below the level of the table, placing the graduations on the wheel and point of grinding where the operator can see both simultaneously. It eliminates reaching overhead when bringing the grinding wheel down.



A timing belt drive actuates the table. Lead screws are made from a special long-wearing lead screw steel and are precision thread-ground.

Hard chrome table ways are said to eliminate the need for periodic re-scraping. The special Covel plating process applies a hard chrome surface to the V and flat ways after they have been precision hand scraped from a master plate.

Covel Manufacturing Company, Benton Harbor, Michigan, Dept. 716.

Use HANDY Postpaid Card. Circle No. 124

Coolant-Aerator for 1¼" Pipe

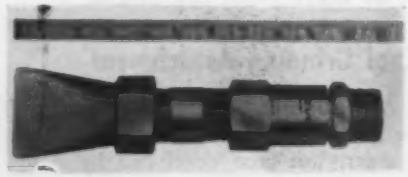
Melard Mfg. Corp. introduced its new series No. 1000 large Mel-o-Flo coolant-aerators at the Metal Show in Booth 1734. These aerators are for use on 1¼" or 1" coolant lines on large machine tools.

The Mel-o-Flo coolant-aerator connects directly to the coolant line and mixes atmospheric air with coolant resulting in a non-splash aerated mixture that clings to work and tools. A simple, self-cleaning mechanism purges the Mel-o-Flo coolant-aerator of chips and sludge whenever the coolant supply is interrupted. The aerator requires no compressed air line or special plumbing.

Fan nozzles and spreader plates are available to connect to the outlet of the aerators for covering large areas or wide grinding wheels.

Melard Manufacturing Corp., 432 Austin Place, New York 55, New York. •

Use HANDY Postpaid Card. Circle No. 125



Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

MODERN Self Contained GRINDER-POLISHER

Hammond Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe. Models up to 50 HP available.

Hammond Cyclone Duskolector. One of a wide line of Cyclone and Filter Types.

Hammond Backstands. 10 Air and Spring Tension Models to choose from.

Write for Catalog No. 60 showing America's most modern and complete line.

Hammond Machinery Builders INC
1651 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN
Circle No. 239 on postpaid card

Centerless Grinder

The Van Norman Machine Co. of Springfield 7, Mass., has developed during the past two years a rugged, versatile, fast and accurate centerless grinder known as the No. 1-C.

The 1-C incorporates two outstanding features which make it an outstanding machine in the centerless grinding field. These two features embody the special construction of its two wheel spindles. Both the grinding wheel spindle and the regulating wheel spindle are self contained, prelubricated, totally enclosed, and operating with super-precision double row bearings that assure trouble free, smooth, anti-friction cool, vibrationless operation. These spindles need no warm up period.

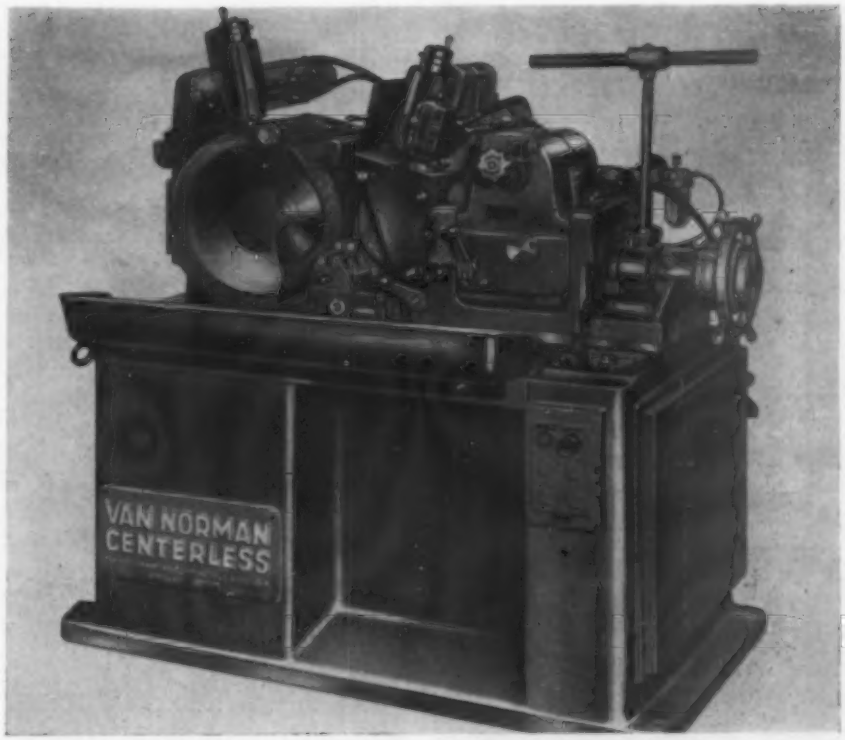
One of the great problems in crush dressing a wheel, is to have the surface of the wheel run absolutely true when grinding. This is made exceedingly difficult when the wheel speed is reduced to a rough estimate of 100 sfpm on the periphery of the wheel when being crushed. After crushing, the wheel is brought to a top speed of 6500 sfpm, and if any evidence of deflection has appeared during the crushing operation, the result in grind will show chatter. Any deflection in oil film or in the spindle itself, even though this deflection may amount to but .0001", will show a chatter on the work piece. The use of anti-friction bearings in the spindles of the No. 1-C machine removes all chances of oil film deflection.

Crush dressing of the grinding wheel has proven to be most economical. It is quite common to grind ten times the number of parts with a crush-dressed wheel over a diamond dressed wheel. When the crushing roll comes in contact with the surface of the wheel, the pressure of the roll shatters the grain similar to a gem stone which has been crushed beneath a hammer, exposing sharp points.

One precaution must be adhered to as far as the crush dressing method is concerned, and that is the structure of the wheel must contain sufficient porosity to allow the shattered portions of the grain to clear themselves in the wheel itself. After the wheel has rotated to the point where coolant can be applied, the loose particles are washed away from the wheel, leaving the wheel clean and sharp.

A most effective cooling agent in crush dressing has proven to be a light No. 5 oil. The oil acts as a cushion for the crushing roll and also serves as an excellent cleaning agent for the wheel being crushed.

This is an ideal machine for grinding a great variety of small parts made of metal, plastic, glass, etc., such as bearings, bushings, drills, bolts, valves, shafts, tubes, punches, awls, cap screws, which are straight formed; parts of two or more diameters or special con-



This centerless grinder features self-contained, pre-lubricated, totally enclosed grinding wheel and regulating wheel spindles, and crush dressing attachment.

STERLING
Model "DV"
Variable Angle
DRILL GRINDER

ONE Drill Grinder Sharpens ALL Drills

- 90° to 140° Included Angle
- 1/8" to 2 1/2" Diameter
- 2-3-4 Flutes
- Without Chucks or Collets

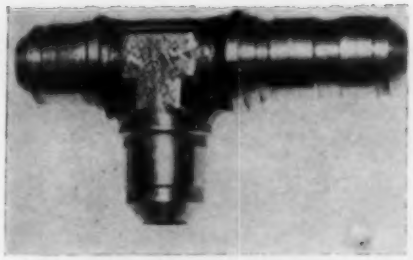
Write for complete information on the STERLING Model "DV" Drill Grinder

This Tool & Cutter Grinder has BIG CAPACITY
(11" swing—14" between centers)
At LESS Cost

Sterling Model "RK-2" provides more capacity at half the cost of a Universal Grinder. Write for details.

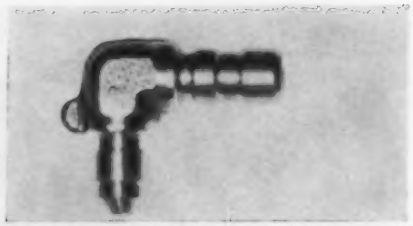
McDONOUGH MFG. CO.
1522 GALLOWAY • EAU CLAIRE, WISCONSIN

Circle No. 240 on postpaid card



tours. It is especially suited for grinding parts used in business and office machines, sewing machines, electrical appliances, aircraft, automobiles, munitions, and similar work. •

Use HANDY Postpaid Card. Circle No. 126



These two airplane hydraulic fittings took 20 seconds to grind per end from solid stock.

Belt Unit Accessories

A new accessory list has been published for the 6-72 Belt Unit made by

Grinding & Polishing Machinery Corporation. This tool is a machine in its own right when suspended or set upon its own stand; it can, however, become a part of another machine when attached to a metal lathe, for example, and lends itself with accessories to many uses in a machine shop.

Grinding & Polishing Machinery Corporation, 2530 Winthrop Avenue, Indianapolis, Indiana. •

Use HANDY Postpaid Card. Circle No. 127

Self-Priming Hand Pump

A new piston-type, positive-displacement, self-priming hand pump now in production delivers 20 gpm at lower cost per gallon than their rotary vane-type hand pumps rated at 10 gpm as announced by Bowser, Inc., 1300 E. Creighton Ave., Fort Wayne, Ind.

Features include stainless steel replaceable liner, stainless steel shaft,

aluminum body and piston, corrosion-resistant valves and molded plastic bearings, and built-in strainer. Fast disassembly permits easy cleaning or reversing of flow direction according to the manufacturer.

Available as pump only, barrel pump, pedestal pump or with hose and nozzle delivery, the all-corrosion-resistant moving parts are said to make the pump suitable for handling many industrial solvents, lubes, cutting or paint oils, and soaps, waxes and maintenance liquids. •

Use HANDY Postpaid Card. Circle No. 128

NEW HANDEE Slide Abrader LOW COST for Small parts finishing

- Pays for itself in 15 runs.
- Eliminates expensive handwork.
- Uses Novaculite or other conventional types of tumbling media and compounds.
- Effectively deburrs and finishes small parts.
- Portable . . . has three-speed drive.
- Rugged Construction . . . precisely engineered.

Write for complete information.

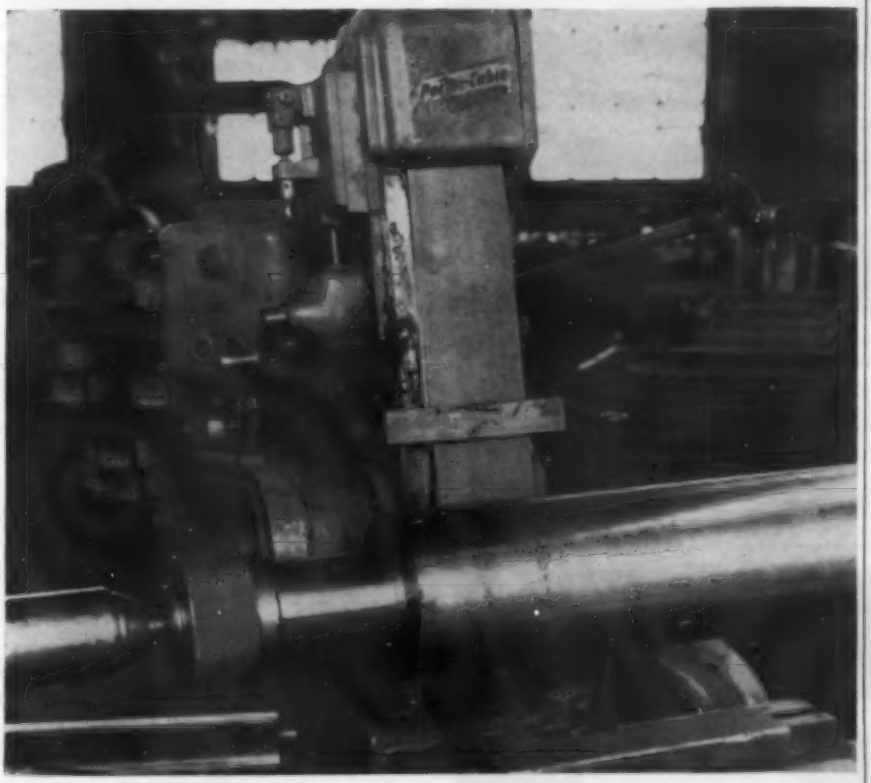
Another First for **Chicago Wheel** *& Mfg. Co.*

Dept. G-10 1101 W. Monroe Street, Chicago, Illinois

Circle No. 241 on postpaid card

"What's all this about doing some internal grinding?"

Saves $20,000 With Abrasive Belt Machine



Using an abrasive belt roll grinder, mounted on a lathe, saved Dake Engine $20,000 a year.

Grand Haven, Mich.— Special to Grinding and Finishing

• Changeover from hand file and emery cloth polishing methods to a modern abrasive belt grinding technique, has resulted in a $20,000 production cost saving in this operation for the Dake Engine Co., Grand Haven, Mich.

Dake Engine was faced with the same problem faced by all manufacturers: keeping rising operating costs down. They explored the possibility of using a new method of lathe polishing. The parts they were grinding were hydraulic press pistons and tie rods in sizes ranging from 3 in. to 11½ in. O.D. and in lengths from 30 in. to 90 in. These cylindrically shaped parts of 1045 hot roll steel were being machined by hand file and emery cloth as they were turned on centers in a lathe. This method was slow and costly and failed to produce the close tolerances and finish needed.

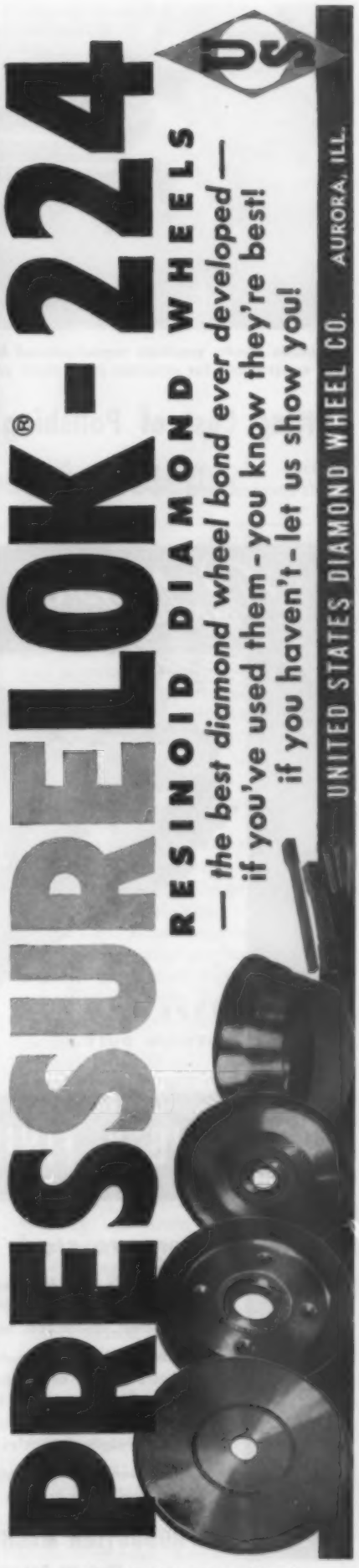
Their first change was to a lathe wheel grinder. This method also proved unsatisfactory as the wheel, due to vibration and coarse feed of the lathe, left surface marks on the parts. Wearing of the wheel on a long job also created a taper problem.

Company engineers realized that neither the hand method nor the lathe wheel grinder could possibly meet their production requirements.

To do the job, they selected an Engelberg/Porter-Cable roll grinder employing an abrasive belt for contact wheel grinding. This grinder, designed for wet or dry operation, can be mounted on the cross slide or tool post holder of the lathe and uses a 4-inch wide belt. Depending upon the job, the motor utilizes from 1½ to 5 h.p.

Upon application, Dake Engine found that this roll grinder removed stock to their specified size, held very close tolerances in respect to parallelism and TIR, and provided the required micro inch finish. Since using this roll grinder, they have experienced very little down time, rejection rate has been extremely low, and Dake Engine has increased its lathe production on this operation by eliminating the final finish cut and the need for close tolerances on lathe turning.

High production output and specifications are now being met with a considerable savings in cost to the company. • •


PRESSURE LOK® - 224
RESINOID DIAMOND WHEELS
— the best diamond wheel bond ever developed—
if you've used them - you know they're best!
if you haven't - let us show you!
UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.
US

Circle No. 242 on postpaid card

Hydraulic stroke machine manufactured by Curtis Machine Corp., which is designed and constructed for stainless steel sheet polishing.

Cutting Cost of Polishing Stainless Steel

Many fabricators purchase No. 4 finish stainless steel sheets at an average higher cost of .12 per square foot, as compared with 2B finish material. Forming, welding, and handling of this material, normally require a final finishing or bleeding operation. In many instances, it is necessary to refinish entire sections or sheets that have no marks or scratches, because of the inability to match or blend with the finish as applied by standard high production methods of sheet polishing.

To reduce costs, and speed production of this operation, several stainless steel fabricators have installed hydraulic stroke machines, manufactured by the Curtis Machine Corp. of Jamestown, N.Y. These machines are specially designed and constructed for stainless steel sheet polishing. This low cost, high production machine, enables the fabricator to purchase No. 2B material and finish the same at a lower cost.

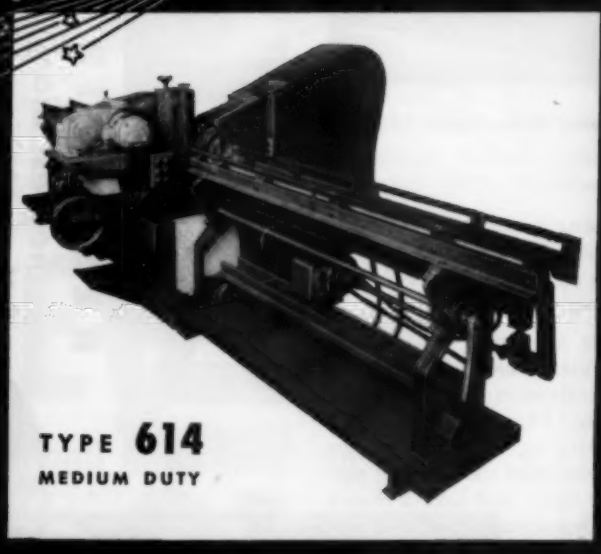
The machine has an automatic traversing table that feeds the material under the coated abrasive belt. A standard dust collector attached to the special vacuum feed table, firmly holds the sheet during the polishing operation, regardless of sheet size or gauge. The hydraulically operated reciprocating polishing head, with a 6″ diameter 5″ wide buff section, traverses at a high rate of speed over the length of the sheet. Grinding pressure on the polishing head is controlled by a pneumatic air cylinder, permitting constant pressure over the entire length of stroke. The operator activates one operating control valve for a completely automatic polishing operation. Speed and length are controlled according to the length of material.

One user has reported a savings of $2.00 per sheet based on the following production and material costs. Time consumed, 5 minutes in polishing a 3 foot wide by 10 foot long sheet, or a maximum production of 12 sheets per hour. (360 square feet.) Approximate labor cost per sheet .17. One silicon carbide coated abrasive belt 6″ wide by 424″ long at an approximate cost of $4.00 per belt polishes 25 sheets. Approximate abrasive belt cost .16 per sheet. The complete operation is performed without the use of oils or coolants.

Based on the above figures and assuming a labor rate of $2.00 an hour, the actual cost of finishing stainless steel sheet is estimated at less than .015 per square foot.

Pre-ground sheets have another disadvantage in that small strips that normally cannot be used due to the grain line running in the wrong direction, can now be used because the fabricator can control the direction of the grain line by doing the finishing in his own plant. • •

Production CENTERLESS



GRINDING & FINISHING MACHINE

Remove stock faster at less cost . . .

Production's 614 Machine combines belt method of centerless grinding and finishing with exclusive reverse traverse to provide the fastest, lowest cost means of stock removal.

This medium duty machine has a capacity from ½″ to 4″ diameters on bar or tubular stock. Set up can be changed from heavy stock removal to low microinch finishing in minutes. Supporting and feeding fixtures are available for long lengths and various weight capacities.

Our Demonstration Laboratory is ready to process a sample lot of your parts or stock. Write for details.

PRODUCTION MACHINE CO., Greenfield, Mass., U.S.A.

Circle No. 243 on postpaid card

News of the Industry

Sheffield Creates "Autometrology" Division

To help industry cope more efficiently and economically with the mounting precision measurement and control problems posed by the automation age, The Sheffield Corporation here has established a research and development division devoted exclusively to instruments, controls, machines and systems for "autometrology"—combining machining, motion or memory with automatic measuring, it was announced here today by Louis Polk, chairman and president.

The new "autometrology" division is planned to mobilize a staff of several hundred Sheffield gaging instrument, hydraulics, electronic, pneumatic, nucleonic and other specialized engineers under the direction of W. Fay Aller, the company's vice president and director of research, Mr. Polk said.

"Far ahead of automation's growing number of applications in high precision, high volume production," Polk said, "there should be greatly accelerated development of semi or fully automatic methods and systems for maintaining unerring control of the great masses of parts, components and finished units that can be turned out in automated plants."

This stepped-up development program, Aller emphasized, "will evolve the creation and use of complete systems and sequences of gaging and measurement instruments, machines and controls capable of eliminating human error by automatically regulating, supervising and matching sizes and by rigidly controlling quality through all stages of production, assembly, inspection and packaging."

Precision gaging and measurement in many automated plants of the foreseeable future, Aller declared, "must be a 'systems' operation, rather than a series of unit operations because automation itself is a 'systems' method, making it possible for a more rapid and continuous flow of even the most complex parts through all sequences of manufacture."

Sheffield, Polk said, is now devoting a major portion of its annual research and development budget to systems for "autometrology." •

International Harvester Holds "Progress Through Automation" Conference in Chicago

To acquaint its technical manufacturing personnel in the various Harvester division plants with the latest advances in automation equipment and techniques, the Manufacturing Research department of International Harvester Company has just completed a series of seven conferences at the Manufacturing Research facility called, "Progress Through Automation."

Attention was directed throughout the conferences to planning for greater use of automated equipment as a means of reducing manufacturing costs. About 400 key men from the various Harvester manufacturing plants attended the two-day sessions of the conference. Acknowledged authorities on various topics within the subject of automation were featured as speakers, and many machine tool builders and other automation equipment manufacturers participated in the conferences by demonstrating their latest equipment to the Harvester men.

A number of grinding and honing machines were included in the demonstrations; GRINDING and FINISHING will feature the machines shown at the conference in next month's issue.

Bradford Machine Tool Co. Moves to Lansing, Michigan

Frank B. Stallings of Cleveland, O. has announced acquisition of the machine tool and pedestal grinder product lines of the Bradford Machine Tool Co., a 115 year old machine tool building firm of Cincinnati. Stallings also stated that he had purchased part of the manufacturing facilities of this precision plant which would be moved to Lansing, Michigan, to become another 'Universal' affiliate. Various Bradford personnel are being moved to Lansing from Cincinnati.

A new company has been formed—The Bradford Machine Tool Co. of Michigan, and this company will continue to manufacture the precision, 12, 14, and 16" engine and toolroom lathes and pedestal grinders of from 1 to 30 hp that have made the name Bradford well known over the past century. R. B. McDowell of East Lansing is vice-president of the new firm and will actively manage this affiliate.

Jones & Lamson Buys Modern Tool

Jones & Lamson Machine Company, Springfield, Vermont, has acquired the physical inventory, work in process, trade names and designs of the Modern Tool Works, Rochester, New York.

Jones & Lamson plans to integrate the new line with its existing line of tools in the Thread Tool Division. The line will consist of collapsible taps and chasers, solid adjustable taps and chasers, the Modern Magic Chuck, and the Modern Stud Setter. Chasers for the Modern die heads will continue to be manufactured for those customers who have these die heads. •

Micrometrical Appoints Six Representatives in East

Micrometrical Mfg. Co., Ann Arbor, Mich., has appointed the following eastern firms as their representatives for the Profilometer, Wavometer and Anderometer: Walter J. Greenleaf Co., Pittsburgh; C. E. Etzler Co., Drexel Hill, Pa.; Harry R. Berkshire Co., Tenafly, N.J.; Anderson-Newton Sales Engineering, Rochester, N.Y.; W. H. Gourlie Co., West Hartford, Conn.; Sterling Sales, Inc., Worcester, Mass.

George Haber is the Micrometrical field representative in charge of this area. Haber's territory also includes Canada, where the company is represented by Williams & Wilson, Ltd. in principal industrial centers.

Whitfield J. Bell, retired Norton Co. abrasive engineer, died April 2 at his home in Baltimore, Maryland.

He retired in September, 1953, after 38 years with the company. During much of this time, he represented Norton in Maryland and Delaware.

Training Session at Armour

Distributor salesmen from the **A. N. Nelson Company,** Kearny, New Jersey and the Greenville Lumber & Supply Company, Greenville, Pennsylvania, recently completed a one-day training session at Coated Abrasives Division, Armour and Company, Alliance, Ohio.

Mr. Dave Cameron represented the Greenville Lumber & Supply Company. Those from the A. N. Nelson Company included **Ken Fitzer, Eric Carlson, Jim Eigo, Len Smallheer, Bob Golden, Jim Kaiser, Bill McDonough,** and **Bill Willoughby.**

The training session included a tour through the plant and lectures in the training laboratory on the usage of coated abrasives.

Erickson Tool Co. Appoints Canadian Representative

Erickson Tool Co., Cleveland, announces the appointment of Ammco Industrial Equipment Limited as sales representatives for the company's line of precision holding devices. Ammco's territory covers that portion of Ontario south of a line drawn from Parry Sound to Renfrew.

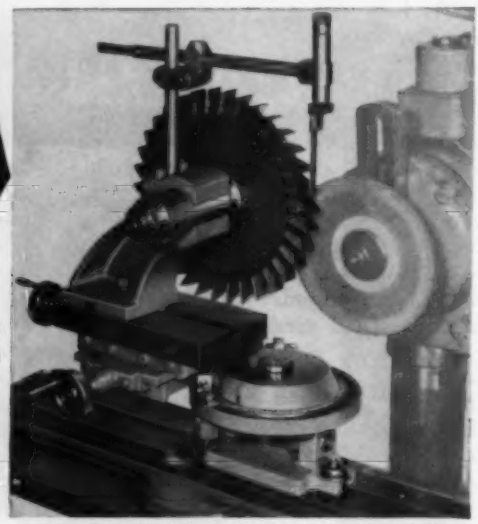
Wilfrid A. MacTavish, Ammco president, P. E. Avery, and Elton Morrison formerly presented the Erickson story as sales representatives for Acme Machine Tool and Acme Bertram. In addition, direct factory engineers will be available for consultation on tooling problems.

Ammco Industrial Equipment Ltd., 1377 Weston Rd., Toronto 9, Ont. •

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

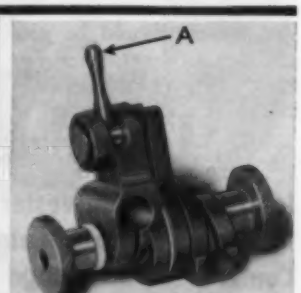


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 603

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

Circle No. 244 on postpaid card

Underwood Corporation Wins Almco Supersheen Award

The Underwood Corporation, Hartford, Connecticut, manufacturer of business machines, is a grand prize winner of the Almco Supersheen Award for outstanding cost savings with Almco barrel finishing equipment, it has been announced. The award is one of several given each year by the Almco Division, Queen Stove Works, Inc. of Albert Lea, Minnesota. Winners are determined by judging cost studies of Supersheen barrel finishing equipment versus other methods of finishing.

Mr. O. D. Ladley, Manager of the Almco Eastern Division, is shown awarding $250 prize check to Mr. J. P. Scavo of the Underwood standards engineering department. Cost analysis submitted by the business machine manufacturer showed savings of $6632 annually on carriage end covers processed with Almco equipment.

Underwood reported a cost savings of $.01783 per part, basing its figures on carriage end covers processed with Almco barrel finishing equipment. The award - a plaque plus a $250 check - was won on the basis of Underwood's cost study which showed savings of $6632 a year through the use of Almco's barrel finishing machines which automatically debur, grind, polish, burnish and perform other finishing operations.

In addition to dollar savings, the Underwood Corporation reported that the carriage covers finished with Almco equipment were more uniform and provided an ideal base for paint. The company formerly used a manual method of wheel deburring. This resulted in a high percent of rejects due to cuts through the thin wall of the covers.

Besides its grand prizes, the Almco Company annually makes two awards of $100 and two others of $50 in each of two classifications: total dollar savings and percent of savings through the use of Almco equipment. As previously announced, the grand prize winner in the total dollar saving division was the LeRoy Machine Company of LeRoy, New York, a firm that saved $124,000 annually with one Supersheen fixture barrel. This Almco equipment was used to debur compressor rotor discs for jet aircraft.

The contest can be entered by any concern using Almco Supersheen finishing equipment. Details are available from the Almco Division, Queen Stove Works, Inc., Albert Lea, Minnesota. •

Production Machine Shows New Units at National Metal Exposition

Production Machine Company featured a new traverse reversing device on a centerless grinding machine as part of a large exhibit at the National Metals Exposition. For the first time in Cleveland the company demonstrated their Type 614 centerless grinder using abrasive belts as cutting and feeding media. This machine will handle long bars and tubes up to 4″ diameter using power driven fixtures. For heavy stock removal requiring several passes, the traverse reversing device is used which permits grinding of the work piece in both directions of traverse. This feature reduces production time to a minimum.

Another new machine shown for the first time is a twin belt surfacing machine with a rotary feeding fixture. This machine will grind both ends of slug stock simultaneously at high production rates.

Two centerless machines connected in tandem were demonstrated showing a precision grinding operation and a two pass finishing operation on cylindrical bar stock. These machines operating as a unit will produce accurate work and a low micro inch surface finish in a single handling.

VERSATILE PRECISION GRINDING!

Or a combination of both . . . or specials for single purpose application

Constant speed motor delivers consistent spindle speed under any load within rated capacity. External and internal grinding heads are interchangeable . . . internal spindles reversible for either left or right precision grinding . . . direction of rotation changed to suit. Large, flat mounting pad (with ample bolt slots) adds to grinder's versatility . . . can be mounted to nearly any other production machine for a wide range of accurate work, large or small. For adaptation to special, single purpose applications, write for details. Successfully used for grinding both the common and unusual materials.

Write for catalog 56-BF.

The CINCINNATI ELECTRICAL TOOL CO.

Division of The R. K. LeBlond Machine Tool Co.

2695 MADISON ROAD, CINCINNATI 8, OHIO

Circle No. 245 on postpaid card

DoAll Offers Training Course for Inspection and Calibration of Gage Blocks in Your Own Shop

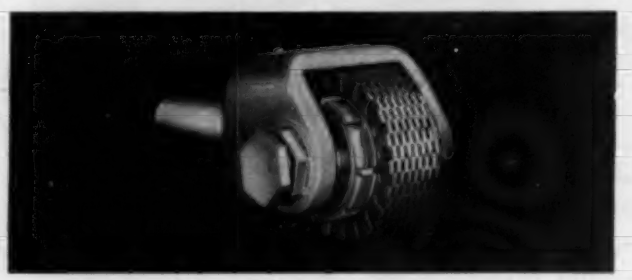
Here is all the equipment needed to make a quick inspection and accurate calibration of your own gage blocks in the shop.

As an educational service to industry, The DoALL Company now offers detailed information to all users of gage blocks that will permit them to set up a program whereby they can inspect and calibrate their own gage blocks accurately with only a few items of simple equipment and without expensive air-conditioning facilities. The procedures and facilities employed are so practical that even the smallest company using gage blocks can put the program into effect.

This educational service as set up by the DoALL Company has received approval by the National Bureau of Standards. The know-how and equipment now available will encourage more frequent checks so necessary to the maintenance of good quality control standards. Furthermore, it will stimulate awareness of the fact that gage blocks, like other tools, wear and lose dimension with use. Therefore, they require regular calibration.

The program is entitled "How to be Your Own Bureau of Standards." It provides a free, four-day, comprehensive training course at the DoALL Technical Institute in Des Plaines, Ill. The course combines both classroom sessions and laboratory practice. The classroom sessions are concerned with orientation, principles and techniques of interferometry, dimensional controls for tolerances, preparation and interpretation of calibration records, effects of temperature, observational error, etc. In the laboratory, actual procedures, operation of instruments and recommended methods of calibration are practiced. For this practical training work, each trainee is requested to bring a set of his company's own gage blocks. At the conclusion of the course he will have made a thorough inspection and recalibration of these gage blocks, making up a report recording the actual dimension of each block.

PRECISION DRESSER



Desmond precision ball bearing dressers can replace diamonds on surface, centerless, and machine grinders in many instances—at substantial savings. Where diamonds are required for extreme final truing, Desmond precision dressers still can be used for semi-finish dressing. Five models available, each with easily replaceable hardened tool steel cutters and dust-protected ball bearings. Ask your Desmond distributor or write direct for catalog and full information.

The only complete line of grinding wheel dressers and cutters

Desmond

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Circle No. 246 on postpaid card

METAL POLISHING PRODUCTION UP 50%

- Polishes material 1/16" to 1/4" thick
- Uses 40 grit to 220 grit abrasives
- Belts changed in 5 minutes or less

"We have increased our grille polishing by 30% to 50% with the TIMESAVERS Metal Polisher, which is doing a fine, quick job of polishing aluminum, stainless steel and other metals to a high sheen consistent with quality installations," says Mr. Clarence Wilco, plant superintendent of the Hendrick Mfg. Co., Carbondale, Pa.

"With our TIMESAVER Polisher we replaced the laborious hand polishing operation and now maintain production schedules set up by our time study department. There are substantial savings of abrasive materials plus the fact that we train operators in a few weeks, whereas it formerly required years to produce a good hand polisher." *Write for Bulletin*

Manufacturers of abrasive machines for flat wood surfaces... curved surfaces... metals

TIMESAVERS, INC. Box 7446 MINNEAPOLIS 22, MINN.

Circle No. 247 on postpaid card

DoALL's procedure in checking gage blocks for flatness and wear are designed to employ simple, inexpensive equipment. A monochromatic light source, optical flats and a deburring stone comprise the basic equipment plus some minor accessories for cleaning and wiping blocks. Instructions for using this equipment are complete even to the point of providing charts against which fringe line readings can be compared for a rapid determination of flatness of the gaging surfaces. An out-of-flat condition signals wear and consequent need for recalibration.

Harold C. Miller Receives Award from I.D.A.

A citation for service to the diamond industry was presented to Harold C. Miller of Armour Research Foundation of Illinois Institute of Technology, Chicago, on May 23, by the Industrial Diamond Assn. of America.

Miller, who is manager of magnetic recording research at the Foundation, served as technical chairman of the industrial diamond symposium and exhibition held March 19-21 in Chicago in conjunction with the national convention of the American Society of Tool Engineers. He is a specialist in high-pressure research, including problems relating to diamonds.

Paul S. Washburn

Paul S. Washburn has been appointed a Field Engineer assigned to the Pittsburgh district office of Norton Company.

Washburn first joined Norton Company in 1951. He later left to serve in the U.S. Air Force as a pilot for four years. Since his return, he completed the sales training course and prior to his present appointment, he was a member of the sales engineering department. He is a graduate of Worcester Academy and Amherst College. •

New Field Engineers for Simonds Worden White

Simonds Worden White Co., Dayton, Ohio has announced the appointments of **Casey Natonski** and **Pete Bojanic** as Field Abrasive Engineers.

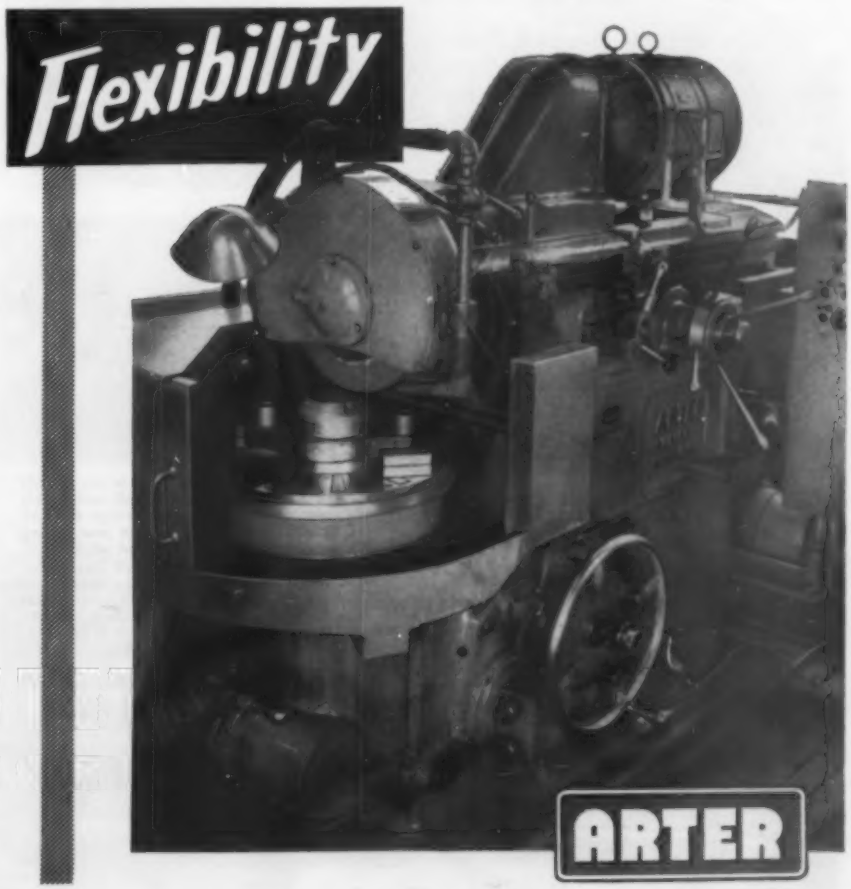
Natonski has been assigned to the Chicago office, covering Illinois, Wisconsin and Missouri. He was formerly associated with the Ford Motor Co., Aircraft Engine Div. as an abrasive engineer.

Bojanic will serve Penna., New York, New Jersey and Eastern Ohio. He was formerly a methods engineer in charge of abrasive control with Thompson Products, Inc., Harrisburg, Pa.

Torit Names 3 Representatives

Torit Mfg. Co., has recently named three new district sales representatives to handle their line of industrial products.

They are Taze and Hewitt, of Baltimore, covering the state of Maryland; Union Supply Co. of Denver, in Colorado and eastern Wyoming; and Byron Confer of Indianapolis, in southern Indiana and most of Kentucky.



Arter Model D Rotary Surface Grinders are extremely flexible in their application to a wide range of surface grinding problems. By using special chucks, many seemingly difficult surface grinding jobs are made easy, permitting great savings in set-up time.

Here is one of General Electric's Arter Model D 16" Rotary Surface Grinders being used to grind punches for motor laminations. The chuck has a large diameter central hole to provide clearance for the shank.

The Arter Model D has great vertical capacity, hand and automatic feeds and a tiltable worktable. An arrangement for grinding work in a complete automatic push button cycle can be supplied.

For the best answer to your surface grinding problems — ask your Arter engineer.

ARTER GRINDING MACHINE COMPANY
WORCESTER 5, MASSACHUSETTS
Jigmatic Automatic Tape Controlled Positioning Table • Rotary Surface Grinders
Flat Circular Cutter Grinders • Internal Grinders • Cylindrical Grinders • Carbide Tool Grinders
AGENTS IN INDUSTRIAL CENTERS OF UNITED STATES AND CANADA

Circle No. 248 on postpaid card

Kenneth F. Ebbeson has been appointed an abrasive engineer for Norton Co. for the Metropolitan Boston area. Since 1952, he has been a field engineer in the New England area.

Ebbeson is a graduate of Rensselaer Polytechnic Institute, and has been with Norton since 1946 where he was a grinding engineer in the sales engineering department for several years. In his new post, he succeeds Sidney B. Wetherhead who has been named to the new post of manager of distributor sales.

The appointment of **Donald E. Pierce** as manager of Brush Electronics Company's equipment sales department has been announced by C. B. Hoffman, vice-president in charge of sales.

Late in 1947, he joined the staff of television stations WEWS in Cleveland as a video engineer, later becoming program manager. In 1951 he became a sales engineer for the H. A. Wilson Company, Union, N.J., and in 1953 joined Brush, a division of Clevite Corp., as a recording systems salesman. He was appointed assistant manager of the equipment sales department early in 1955.

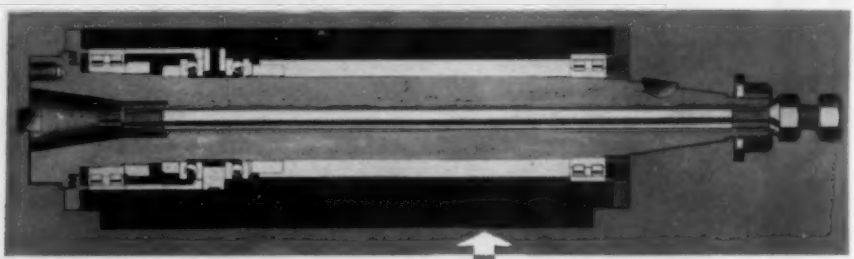
Kenneth L. Bates of 17 Holt Road, Holden, Massachusetts, has been appointed a Field Engineer by Norton Company. He will assume his new duties September 1.

A graduate of Bates College, he joined Norton in 1937. He worked in several of the manufacturing departments and in the research laboratories. Since 1949, he has been an instructor in the Norton School of Grinding.

Kenneth F. Ebbeson

Donald E. Pierce

Kenneth L. Bates



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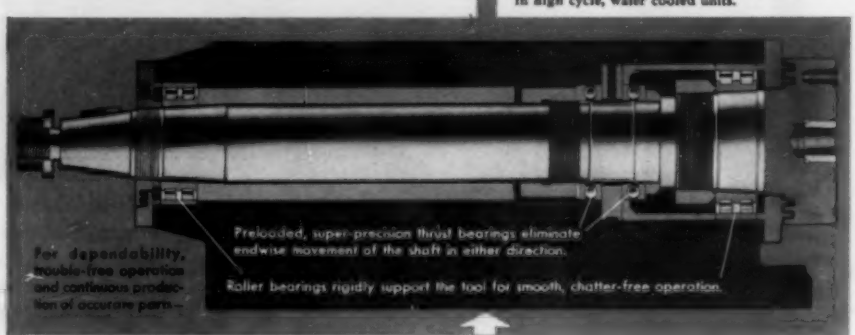
See for yourself! Here is one sturdy package with a massive shaft, and double row cylindrical roller bearings and ball thrust bearings that support your cutting tools rigidly to do their best work.

POPE P-12000 Series Belt Driven Precision Milling Spindles are operable in any position. They come in sizes from 1 to 50 HP with standard milling machine tapers in the nose from #10 to #60. Bulletin S-8 gives complete dimensions. Let us mail you a copy.

POPE Heavy Duty Milling Spindles are also available in P-2500 Series, MOTORIZED, from 1 to 100 HP, totally enclosed, fan cooled; and in high cycle, water cooled units.


Preloaded, super-precision thrust bearings eliminate endwise movement of the shaft in either direction.
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For dependability, trouble-free operation and continuous production of accurate parts—

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No. 112

Specify **POPE** PRECISION SPINDLES

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Established 1920
501 RIVER STREET · HAVERHILL, MASSACHUSETTS

Circle No. 249 on postpaid card

Rivett Lathe & Grinder, Inc. has appointed **Overgard Machine Tool Co. Inc.**, 2045 West 8th Avenue, Denver 4, Colorado, as exclusive distributor in the Colorado-New Mexico territory for Rivett machine tools.

Promotion of **Joseph F. Ramey** to Boston branch automotive and industrial trades sales manager, coated abrasives division, has been announced by Minnesota Mining & Manufacturing Co.

Ramey succeeds **John H. Hargreaves,** who is retiring after 34 years of service with 3M. Ramey joined 3M in 1948 in the company's St. Paul branch office.

In 1949 Ramey became a member of the coated abrasives sales force and was made the division's eastern region sales supervisor in 1955.

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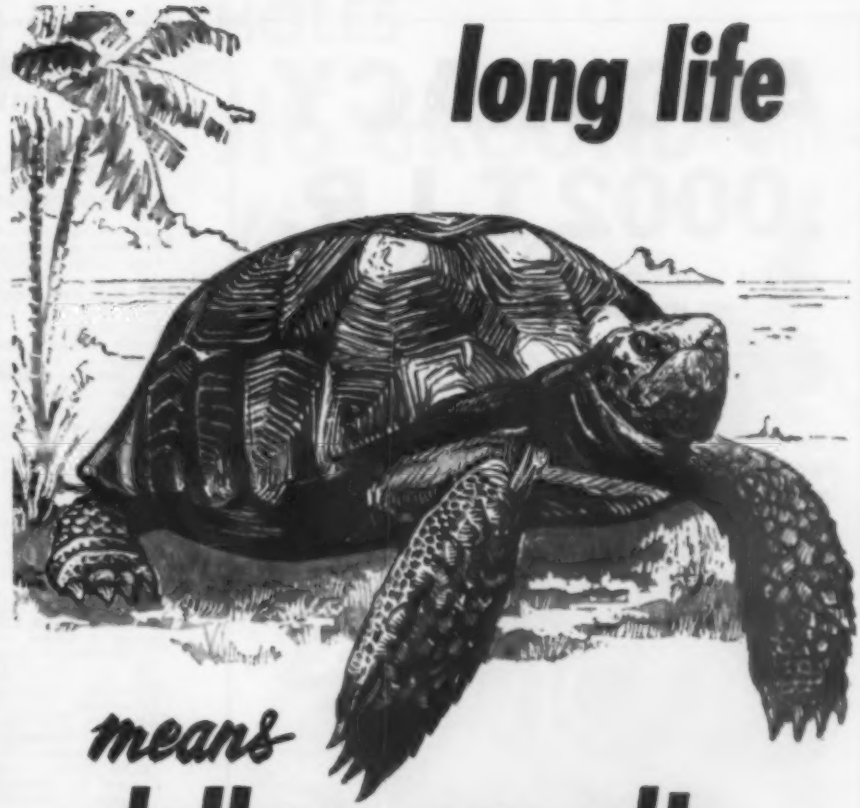

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Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

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Send for your copy of our new Diamond Wheel Catalog No. 54.

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MURRAY HILL NEW JERSEY

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.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

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No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B&S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

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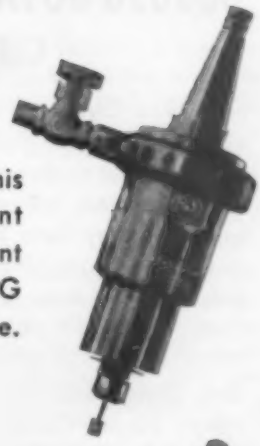
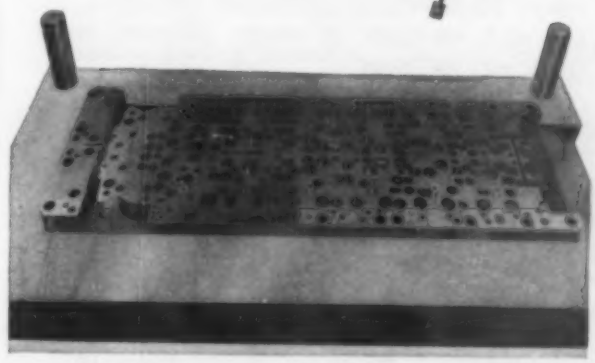
JIG GROUND with

Vulcanaire



Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



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*Vulcanaire equipment pays for itself on the first job.

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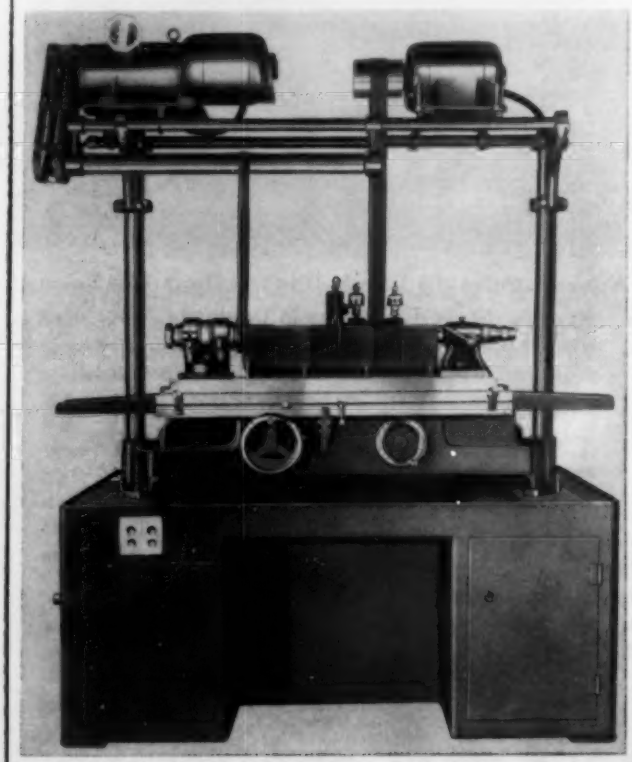

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Since 1910

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TIFFIN, OHIO

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